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## NUMBER RELATIONS

THE UNIVERSITY OF CHICAGO

THE HAWORTH SERIES OF ARITHMETICS

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6

# NUMBER RELATIONS

BY

ERWIN H. SCHUYLER

INSTRUCTOR IN MATHEMATICS IN THE SACHS COLLEGIATE INSTITUTE  
FOR BOYS, NEW YORK

AND (AS CRITICAL ADVISER)

JAMES H. VAN SICKLE

SUPERINTENDENT OF CITY SCHOOLS, BALTIMORE, MD.

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## PREFACE

THE HAWORTH SERIES OF ARITHMETICS consists of three books covering a six years' course of study in the subject. The entire course can be finished in the sixth grade. After this, arithmetic as a separate study should not be necessary.

Part I of "Number Foundations," the first book of the series, is intended to cover the work of the first school year. It need not be in the hands of the pupils, but it will serve as a guide to the teacher in planning oral lessons, and pupils of the second grade may read it with profit by way of review before beginning the regular work of the year. Part II of "Number Foundations," published also as a separate volume, covers the work of the second school year.

The second book of the series is intended for the third and fourth years, and the third book for the fifth and sixth years. Those who are compelled by local conditions to finish the series in the seventh instead of the sixth year will find that the books readily adapt themselves to this purpose.

The series is the outcome of long experience in teaching and supervision. In preparing it the authors have aimed first of all to give the pupil a knowledge of the essentials of the subject and independent power of application without consuming an undue portion of his time or that of his teacher. They realize that other subjects in the curriculum, rich in educative value, have too commonly failed to receive their fair share of attention on account of the excessive demands of arithmetic.

The old arithmetics were unnecessarily difficult; partly

because the order followed in presenting material failed to conform to the order in which the child naturally acquires mathematical ideas; partly because of the many obsolete and useless topics treated; and partly because of the puzzling problems introduced solely for the sake of the mental discipline which their solution was said to afford.

The method of presentation here followed is closely inductive. Problems are not assembled promiscuously or by chance. In general, each lesson presents a development in which every problem is seen to be a necessary step toward a generalization or the mastery of a process. In like manner each lesson usually serves as a direct preparation for the next lesson. The careful attention given to grading has resulted in a set of books that the pupil can use by himself. Difficulties there are, but these have been led up to in such a way that the pupil is not forced to rely constantly upon the teacher for guidance and help.

Drill exercises have been freely introduced to fix processes that have been learned. Set reviews have, for the most part, given place to exercises calling for the application of what has been learned to new conditions.

The criterion of use has been the one adopted in choosing the topics treated. The fundamental operations of arithmetic with their simple applications are the only ones that pupils in elementary schools have opportunity to employ. After developing these and fixing their technique by drill, continued use of arithmetic in connection with drawing, manual training, geography, physics, etc., as called for in considering the quantitative aspect of such studies, will furnish sufficient practice to keep arithmetic a ready tool. The time allotted to mathematics in the seventh and eighth school years may with advantage be devoted largely to further study of constructive geometry and algebra.

In the first two books the pupil is led, by means of exercises involving small numbers, through a wide range of arithmetical experience; then, with somewhat larger numbers and greater complications, he again and again encounters familiar types which he gradually comes to recognize as separate arithmetical topics, but he is never allowed to lose sight of the connections between these topics. After a fair idea of the field of arithmetic has been gained and a sense of its usefulness developed, the distinctly topical plan of treatment is begun. In the third book each large topic is sufficiently isolated to permit its measurably complete development.

Believing that there is a technique that must be mastered, and that this mastery comes through concentration upon the thing in hand, the authors have not attempted to teach arithmetic incidentally. They have sought problems that would emphasize the use of what is learned, but they have not, as some advocate doing, developed arithmetical topics through the study of industries or geographical and scientific material as such. They believe that to do so is to violate the true principle of correlation, which they understand to be this: "In giving a lesson or a series of lessons upon any particular topic, the teacher should press into his service allied material *that will help toward a completer grasp of the topic under consideration*, but should exclude all else."

Applying this principle, they would assent to the proposition that arithmetic may and should serve a valuable purpose in the quantitative study of topics, say, in commercial or industrial geography; but this is merely saying that arithmetic should be used in such branches to the extent that it serves this purpose. It is by no means equivalent to saying that a text-book in arithmetic should be written with the divided aim of teaching arithmetic and geography, or arithmetic and farming,

or arithmetic and any other subject. True correlation in any subject requires that secondary topics shall assist toward a completer understanding of the primary topics. In a text-book in arithmetic the primary topics are manifestly arithmetical ones, and all other topics are secondary.

Arithmetic, like other studies, possesses a unity and continuity of its own which cannot be freely violated without a wasteful scattering of effort. We must follow the order dictated by the nature of the subject and by the pupil's stage of mental development, taking advantage, however, of the multitudinous opportunities that will arise of really helpful correlation. The teacher can select allied material from the child's experience or environment, from current industrial or business life, from science or nature study, material which in its nature is entirely local or transient. While it is desirable to draw upon familiar occupations for problems, it is not true economy of the pupil's time to make an arithmetic a cyclopedia of useful information.

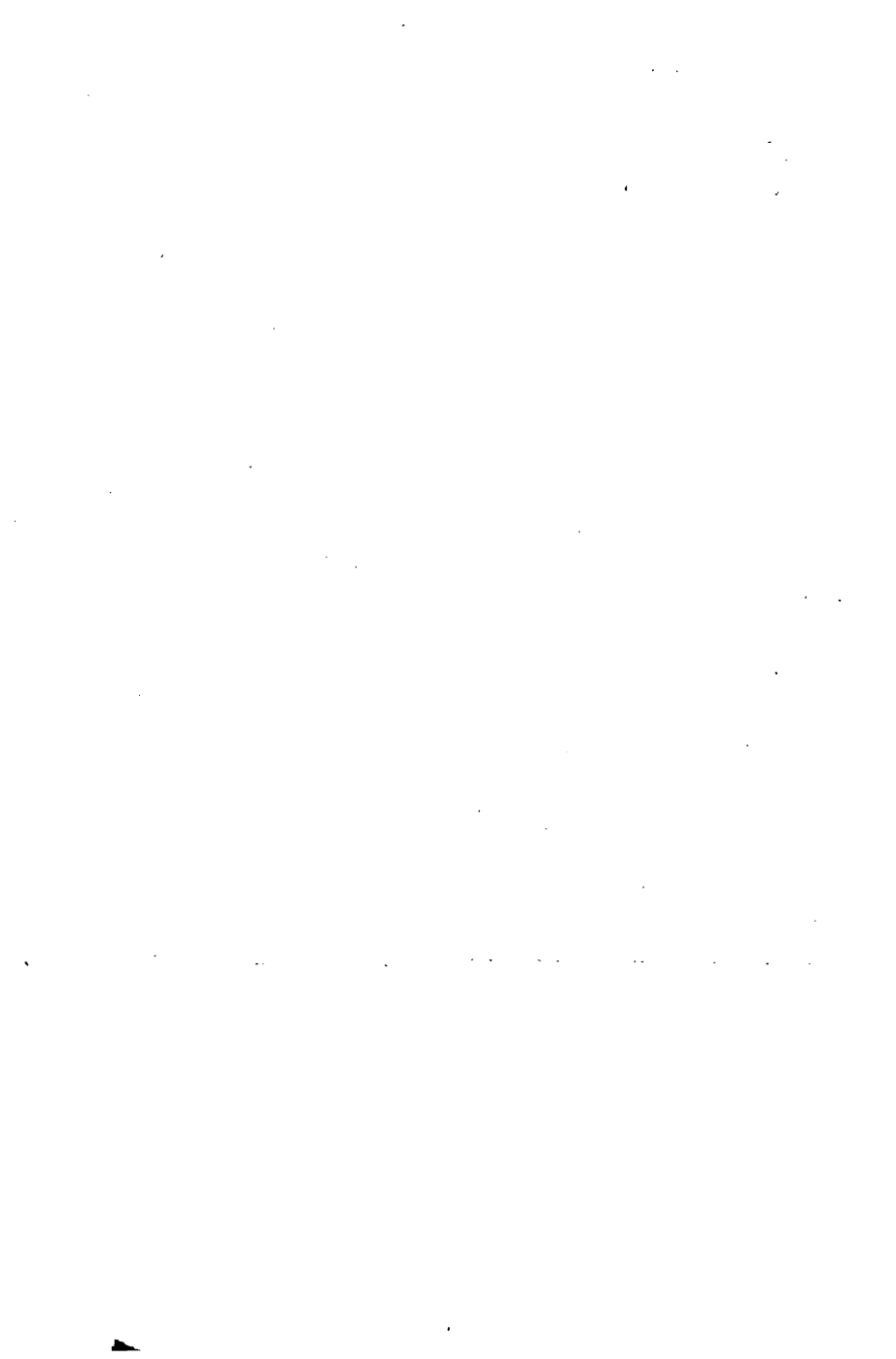
Furthermore, attempts which have been made to frame the problems of a lesson or a series of lessons in arithmetic in such a way as to present a study of an occupation are for the most part open to the objection that the brevity of treatment necessary in an arithmetic defeats the informational aim, and that the topic as an industry demands greater maturity and larger experience on the part of the pupil than do the arithmetical computations really necessary to the study. Either the large industrial topic is too difficult to be timely or the arithmetic is too easy. In this respect, also, we see that the true principle of correlation is violated, since the study of the industry brings no proportionate increase of arithmetical knowledge.

It will be observed that some topics usually treated late in the course appear much earlier in this series of books. This

is made possible by the omission of much work that used to be given under the head of compound denominate numbers and other topics of comparatively little use and by the careful way in which difficulties are approached. The time limit as applied in addition, the graphic method of acquainting pupils with the facts of multiplication and division through their own efforts before the tables are required, calculations from drawings made to a scale, and the graphic treatment of fractions and ratio are among the devices employed in these books to stimulate interest, to vivify ideas, and to minimize drudgery.

Such topics as insurance, taxes, discounting at banks, square root, etc., need not be deferred on account of their difficulty if presented through simple problems, as in the third book of this series.

Geometric forms have been freely introduced from the beginning. By the time pupils reach the more difficult parts of mensuration they are already familiar with many of the forms and understand area and volume through much previous practice. In the second book algebraic symbols are introduced, and in the third book continued in such a way as to acquaint the pupil with some of their uses and to introduce him to the study of algebra. No work with geometric forms or algebraic symbols has been introduced which has not been as fully tested in the class room as the more ordinary kinds of problems.



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# NUMBER RELATIONS

## PART I

### I. ONE HALF, ONE TO FIVE

(Use one-foot rules. Pupils who have studied "Number Foundations" may omit the first ten lessons of this book.)

$a$  \_\_\_\_\_ 1.  $a$  is \_\_\_\_\_ inch long.  $b$  is \_\_\_\_\_  
 $b$  \_\_\_\_\_ \_\_\_\_\_ of an inch long. A whole  
inch is equal to \_\_\_\_\_ half inches.

2.  $c$  is \_\_\_\_\_ inches long.  $d$  is \_\_\_\_\_ inches long.  
 $d$  is equal to \_\_\_\_\_  $c$ 's.

3.  $c$  is \_\_\_\_\_ as long as  $d$ . Two inches are  
\_\_\_\_\_ of four inches.

4. Four inches are \_\_\_\_\_ times two inches.

5. Make a line as long as  $c$  and  $d$  together.  
Two inches and four inches are \_\_\_\_\_ inches.

6. One half of six inches is \_\_\_\_\_ inches.

7. Draw a line twice as long as  $d$ .

8. A line twice as long as  $d$  is \_\_\_\_\_ inches long.

9. Two times four inches are \_\_\_\_\_ inches.

10. Four inches are \_\_\_\_\_ of eight inches.

11. One half of  $c$  is \_\_\_\_\_ inch. One half of  
two inches is \_\_\_\_\_ inch.

12. One half of  $d$  is — inches. One half of four inches is — inches.

13. Draw a line three inches long. Make it two inches longer. Three inches and two inches are — inches.

14. Copy neatly,  $\frac{1}{2}$ , 1, 2, 3, 4, 5.\*

NOTE. — A serviceable rule can be made by once folding heavy note paper and marking it off in inches.

## II. ONE THIRD, SIX TO NINE

(Use one-foot rules.)

1. Draw a line 3 inches long.

2. Divide it into 3 equal parts. Each part is — inch long. One third of 3 inches is — inch.

3. Draw a line six inches long. Divide it into 3 equal parts by placing a point on it every 2 inches. One third of six inches is — inches.

4. 3 times 2 inches are — inches.

5. Draw a line as long as  $a$  and  $b$  together. Your line should be — inches long. Six inches and three inches are — inches.

6. Measure your nine-inch line with a 3-inch line. — 3-inch lines are equal to the nine-inch line.

7. A 3-inch line equals — of a nine-inch line. One third of nine inches is — inches.

8. 3 times 3 inches are — inches.

\* One half,  $\frac{1}{2}$ . One, 1. Two, 2. Three, 3. Four, 4. Five, 5.

9. 2 times 3 inches are — inches.
10. 4 inches and 1 inch are — inches.
11. 6 inches and 1 inch are — inches.
12. 6 inches and 2 inches are — inches.
13. 2 times 4 inches are — inches.
14. Copy neatly,  $\frac{1}{3}$ , 6, 7, 8, 9.\*

*Add at sight, then copy and add :*

15.	1	2	2	16.	3	3	3
	<u>1</u>	<u>1</u>	<u>2</u>		<u>1</u>	<u>2</u>	<u>3</u>
17.	1	2	2	18.	3	4	4
	<u>1</u>	<u>1</u>	<u>2</u>		<u>2</u>	<u>2</u>	<u>1</u>
	<u>2</u>	<u>2</u>	<u>2</u>		<u>1</u>	<u>1</u>	<u>3</u>

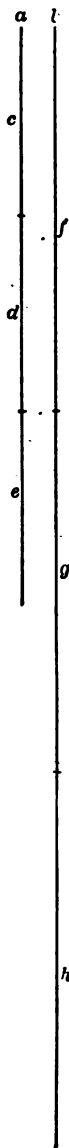
### III. TWO THIRDS, ONE TO NINE

(Use one-foot rules.)

1.  $a$  is — inches long.
2.  $c$  is — — of  $a$ .
3.  $c$  is — inch long.
4.  $c$  and  $d$  are — — of  $a$ .†
5.  $c$ ,  $d$ , and  $e$  are — — of  $a$ .
6.  $b$  is — inches long.
7.  $f$  is — — of  $b$ .
8.  $f$  is — inches long.

\* One third,  $\frac{1}{3}$ . Six, 6. Seven, 7. Eight, 8. Nine, 9.

†  $c$  and  $d$  are two thirds of  $a$ .



9. One third of 6 inches is ——— inches.
10.  $g$  is ——— of  $b$ .
11.  $f$  and  $g$  together are ——— of  $b$ .
12.  $f$  and  $g$  together are ——— inches long.
13. Two thirds of 6 inches are ——— inches.
14.  $h$  is ——— of  $b$ .
15.  $f$ ,  $g$ , and  $h$  together are ——— of  $b$ .
16. One third of 3 inches is ——— inch. Two thirds of 3 inches are ——— inches.
17.  $\frac{1}{3}$  of 3 cents is ——— cent. Two thirds of 3 cents are ——— cents.
18.  $\frac{1}{3}$  of 6 cents is ——— cents. Two thirds of 6 cents are ——— cents.
19.  $\frac{1}{3}$  of 9 inches is ——— inches. Two thirds of 9 inches are ——— inches.
20. Copy neatly,  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{2}{3}$ ,\* 1, 2, 3, 4, 5, 6, 7, 8, 9.

*Add at sight, then copy and add :*

$$\begin{array}{r} 21. \quad 2 \quad 2 \quad 1 \\ \quad 2 \quad 1 \quad 2 \\ \quad 2 \quad 2 \quad 1 \\ \quad 1 \quad 1 \quad 1 \\ \hline \end{array}$$

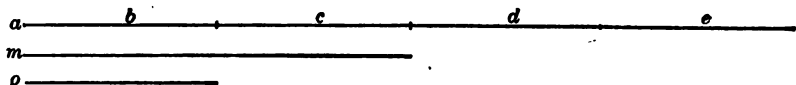
$$\begin{array}{r} 23. \quad 4 \quad 2 \quad 3 \\ \quad 2 \quad 4 \quad 3 \\ \quad 1 \quad 2 \quad 1 \\ \quad 1 \quad 1 \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 22. \quad 2 \quad 2 \quad 3 \\ \quad 3 \quad 1 \quad 1 \\ \quad 2 \quad 3 \quad 1 \\ \quad 1 \quad 1 \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 24. \quad 4 \quad 2 \quad 4 \\ \quad 2 \quad 3 \quad 3 \\ \quad 1 \quad 2 \quad 1 \\ \quad 2 \quad 1 \quad 1 \\ \hline \end{array}$$

\* Two thirds,  $\frac{2}{3}$ .

## IV. ONE FOURTH, THREE FOURTHS



1.  $a$  is divided into — equal parts.
2.  $b$  is — of  $a$ . ( $\frac{1}{4}$ .)
3.  $a$  is — inches long.
4.  $b$  is — inch long.
5. One fourth of 4 inches is — inch.
6.  $c$  is — —  $a$ .
7.  $b$  and  $c$  together are — — of  $a$ . ( $\frac{2}{4}$ .)
8.  $b$  and  $c$  together are also — — of  $a$ . ( $\frac{1}{2}$ .)
9.  $d$  is — — of  $a$ .
10.  $b$ ,  $c$ , and  $d$  together are — — of  $a$ .
11.  $e$  is — — of  $a$ .
12.  $b$ ,  $c$ ,  $d$ , and  $e$  together are — — of  $a$ .
13. Measure  $a$  by  $m$ .  $a$  is equal to how many  $m$ 's?
14.  $m$  is equal to — — of  $a$ .
15.  $o$  is equal to — — of  $m$ .
16.  $o$  is equal to — — of  $a$ .
17.  $a$  is — inches long.  $b$  is — inch long.
18.  $b$  and  $c$  together are — fourths of  $a$ . Two fourths of 4 inches are — inches.
19.  $b$ ,  $c$ , and  $d$  together are — fourths of  $a$ . Three fourths of 4 inches are — inches.

*Add at sight, then copy and add :*

$$\begin{array}{r} 20. \quad 1 \quad 2 \quad 4 \\ \quad 2 \quad 2 \quad 1 \\ \quad 3 \quad 2 \quad 3 \\ \quad 2 \quad 2 \quad 1 \\ \hline \end{array}$$

$$\begin{array}{r} 22. \quad 3 \quad 3 \quad 4 \\ \quad 2 \quad 3 \quad 2 \\ \quad 2 \quad 1 \quad 1 \\ \quad 2 \quad 2 \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 21. \quad 5 \quad 4 \quad 1 \\ \quad 2 \quad 2 \quad 3 \\ \quad 1 \quad 2 \quad 1 \\ \quad 1 \quad 1 \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} 23. \quad 1 \quad 3 \quad 2 \\ \quad 1 \quad 2 \quad 2 \\ \quad 5 \quad 1 \quad 2 \\ \quad 2 \quad 3 \quad 3 \\ \hline \end{array}$$

24. Count to 40.

25. Beginning at 2, count by 2's to 40. Thus, 2, 4, 6, etc.

## V. SQUARE, RECTANGLE

1. One half of 2 balls is  
— ball.

2. One half of 3 balls is  
— and — balls.

3. One half of 4 balls is  
— balls.

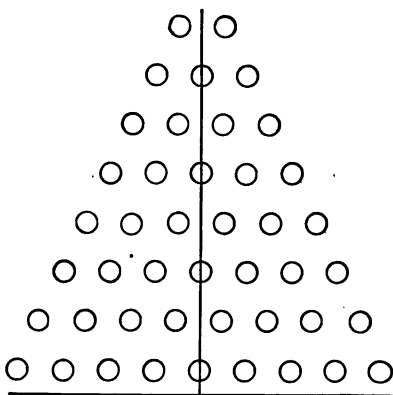
4. One half of 5 balls is  
— and — balls.

5. One half of 6 balls is  
— balls.

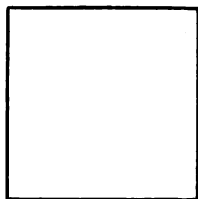
6. One half of 7 balls is — and — balls.

7. One half of 8 balls is — balls.

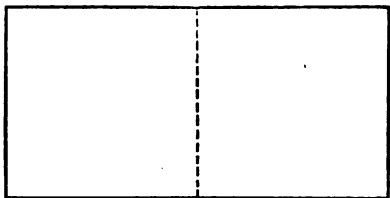
8. One half of 9 balls is — and — balls.



9. Draw a 1-inch square. It is — inch long and — inch wide. To reach around it, a string would have to be — inches long. The perimeter of the square is 4 inches.



10. Draw a rectangle 1 inch wide and 2 inches long, as shown. It contains — square inches.



11. The square which you drew is equal to — of the rectangle.

12. The perimeter of the rectangle (the distance around it) is — inches.

*Add at sight, then copy and add:*

$$\begin{array}{r} 13. \quad 3 \quad 3 \quad 3 \\ \quad \quad 2 \quad 3 \quad 4 \\ \quad \quad \hline \end{array}$$

$$\begin{array}{r} 14. \quad 3 \quad 3 \quad 4 \\ \quad \quad 5 \quad 6 \quad 5 \\ \quad \quad \hline \end{array}$$

$$\begin{array}{r} 15. \quad 2 \quad 2 \quad 2 \\ \quad \quad 4 \quad 5 \quad 6 \\ \quad \quad \hline \end{array}$$

$$\begin{array}{r} 16. \quad 4 \quad 4 \quad 4 \\ \quad \quad 4 \quad 5 \quad 1 \\ \quad \quad \hline \end{array}$$

$$\begin{array}{r} 17. \quad 5 \quad 5 \quad 6 \\ \quad \quad 3 \quad 1 \quad 1 \\ \quad \quad \hline \end{array}$$

$$\begin{array}{r} 18. \quad 6 \quad 6 \quad 8 \\ \quad \quad 3 \quad 2 \quad 1 \\ \quad \quad \hline \end{array}$$

$$\begin{array}{r} 19. \quad 2 \quad 1 \quad 2 \\ \quad \quad 2 \quad 2 \quad 3 \\ \quad \quad 2 \quad 4 \quad 4 \\ \quad \quad \hline \end{array}$$

$$\begin{array}{r} 20. \quad 3 \quad 5 \quad 3 \\ \quad \quad 3 \quad 1 \quad 1 \\ \quad \quad 3 \quad 3 \quad 2 \\ \quad \quad \hline \end{array}$$

21. Beginning at 1, count by 2's to 41. Thus, 1, 3, 5, etc.



## VI. ELEVEN TO TWENTY, +, =

1. If one pencil costs 5 cents, two pencils cost — cents. Ten is written 10.

2. 10 apples and 1 apple are — apples. 11.
3. 10 apples and 2 apples are — apples. 12.
4. 10 apples and 3 apples are — apples. 13.
5. 10 apples and 4 apples are — apples. 14.
6. 10 apples and 5 apples are — apples. 15.
7. 10 apples and 6 apples are — apples. 16.
8. 10 apples and 7 apples are — apples. 17.
9. 10 apples and 8 apples are — apples. 18.
10. 10 apples and 9 apples are — apples. 19.
11. 10 apples and 10 apples are — apples. 20.

This + is the sign of addition and is read *plus*.

12. 6 eggs + 2 eggs are — eggs.
13. 6 eggs + 3 eggs are — eggs.
14. 6 eggs + 4 eggs are — eggs.
15. 6 eggs + 5 eggs are — eggs.
16. 6 eggs + 6 eggs are — eggs.

Observe that signs save space and time.

The sign = is read equal or equals.

*Read, then copy and add (as, 6 plus 2 equal 8):*

17.  $6 + 2 =$

26.  $10 + 5 =$

18.  $6 + 3 =$

27.  $10 + 6 =$

19.  $6 + 4 =$

28.  $10 + 7 =$

20.  $6 + 5 =$

29.  $10 + 8 =$

21.  $6 + 6 =$

30.  $10 + 9 =$

22.  $10 + 1 =$

31.  $10 + 10 =$

23.  $10 + 2 =$

32.  $\frac{1}{2}$  of 2 =

24.  $10 + 3 =$

33.  $\frac{1}{2}$  of 3 =

25.  $10 + 4 =$

34.  $\frac{1}{2}$  of 4 =

35. Beginning at 3, count by 3's to 39.

36. Beginning at 2, count by 3's to 38.

## VII. SUBTRACTION, —

$a$  \_\_\_\_\_

$b$  \_\_\_\_\_

$c$  \_\_\_\_\_

1.  $a$  is \_\_\_\_\_ inches long.
2.  $b$  is \_\_\_\_\_ inches shorter than  $a$ .
3. 4 inches less 2 inches are \_\_\_\_\_ inches.
4.  $c$  is \_\_\_\_\_ inches shorter than  $a$ .
5. 4 inches less 1 inch are \_\_\_\_\_ inches.
6.  $a$  is equal to how many  $b$ 's?
7. Twice 2 inches are \_\_\_\_\_ inches.

8. At 2¢ each, 6¢ will pay for — oranges.

9. At 2¢ each, 8¢ will pay for — oranges.

This — is the sign of subtraction, and is read *minus*.

10. 12 pins — 1 pin = — pins.

11. 12 pins — 2 pins = — pins.

12. 12 pins — 3 pins = — pins.

13. 12 pins — ( ) pins = 8 pins.

14. 12 pins — 5 pins = — pins.

15. 12 pins — ( ) pins = 6 pins.

16. 12 pins — 7 pins = — pins.

17. 12 pins — 8 pins = — pins.

18. 12 pins — 9 pins = — pins.

19. 12 pins — 10 pins = — pins.

20. 12 pins — 11 pins = — pin.

*Subtract at sight, then copy and subtract :*

$$\begin{array}{r} 21. \quad 2 \quad 3 \quad 3 \\ \quad 1 \quad 1 \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 22. \quad 4 \quad 4 \quad 4 \\ \quad 1 \quad 2 \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} 23. \quad 5 \quad 5 \quad 5 \\ \quad 1 \quad 2 \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} 24. \quad 6 \quad 6 \quad 6 \\ \quad 1 \quad 2 \quad 3 \\ \hline \end{array}$$

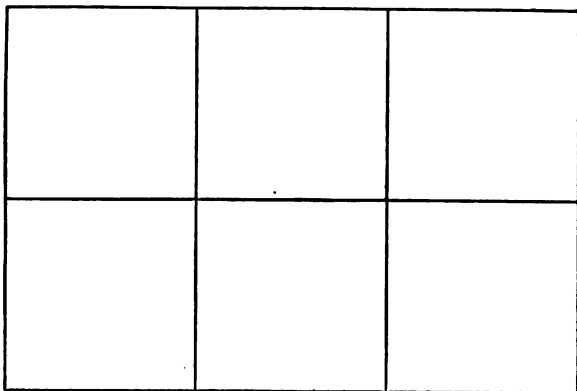
$$\begin{array}{r} 25. \quad 6 \quad 6 \quad 7 \\ \quad 4 \quad 5 \quad 1 \\ \hline \end{array}$$

$$\begin{array}{r} 26. \quad 7 \quad 7 \quad 7 \\ \quad 2 \quad 4 \quad 3 \\ \hline \end{array}$$

27. Beginning at 1, count by 3's to 40.

28. Beginning at 4, count by 4's to 40.

## VIII. RECTANGLE, HALVES, THIRDS



1. Draw a rectangle 2 inches wide and 3 inches long. Divide it into 1-inch squares, as shown.

2. The rectangle is divided into — squares.

3. One half of 6 squares is — squares.

4. One third of 6 squares is — squares.

5. 2 squares are contained in 6 squares — times.

6. 3 squares are contained in 6 squares — times.

7. 2 squares are — third of the rectangle. 4 squares are — thirds of the rectangle.

8. 2 threes are —. 3 twos are —.

9.  $\frac{1}{3}$  of 6 is —.  $\frac{2}{3}$  of 6 are —.

10. 5 inches + 3 inches = — inches.

11. 8 inches - 3 inches = — inches.

12. 8 inches - 5 inches = — inches.

13. 5 inches + 4 inches = — inches.

14. 9 inches - 4 inches = — inches.

15. 9 inches - 5 inches = — inches.

16. 7 inches + 2 inches = — inches.

17. 9 inches - 2 inches = — inches.

18. 9 inches - 7 inches = — inches.

*Add:*

19.	2	3	2	20.	5	3	1	21.	4	3	4
	3	2	1		2	3	1		3	2	4
	1	4	3		4	3	3		2	2	4
	2	1	4		3	2	4		1	4	2
	<u>1</u>	<u>2</u>	<u>5</u>		<u>1</u>	<u>1</u>	<u>2</u>		<u>2</u>	<u>2</u>	<u>1</u>

22.	5	6	7	23.	1	6	4	24.	3	2	1
	4	2	1		5	1	4		6	4	5
	2	3	3		5	2	3		3	5	6
	<u>  </u>	<u>  </u>	<u>  </u>		<u>  </u>	<u>  </u>	<u>  </u>		<u>  </u>	<u>  </u>	<u>  </u>

*Subtract:*

25.	11	11	11	26.	11	11	11	27.	11	11	11
	<u>2</u>	<u>4</u>	<u>3</u>		<u>5</u>	<u>6</u>	<u>7</u>		<u>8</u>	<u>9</u>	<u>10</u>

28.	8	8	8	29.	9	9	9	30.	10	10	10
	<u>2</u>	<u>3</u>	<u>4</u>		<u>4</u>	<u>5</u>	<u>6</u>		<u>5</u>	<u>6</u>	<u>7</u>

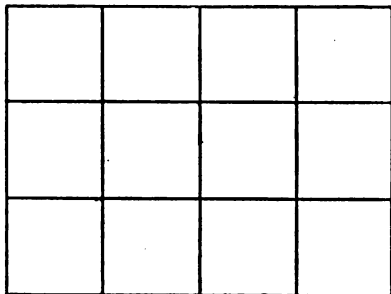
31.	12	12	12	32.	12	12	12	33.	12	12	12
	<u>3</u>	<u>4</u>	<u>5</u>		<u>6</u>	<u>7</u>	<u>8</u>		<u>9</u>	<u>10</u>	<u>11</u>

34. Beginning at 3, count by 4's to 39.

35. Beginning at 2, count by 4's to 38.

## IX. RECTANGLE, THIRDS, FOURTHS

1. Draw a rectangle  $1\frac{1}{2}$  inches wide and 2 inches long. Divide it into half-inch squares, as shown.



2. Along the top are — squares.

3. There are — such rows.

4. In all there are — squares.

5. 3 times 4 squares are — squares.

6. Along the left side is a row of — squares.

7. There are — such rows.

8. 4 times 3 squares are — squares.

9. 4 squares are — — of the rectangle.

10. 4 is — — of 12.

11. 3 squares are — — of the rectangle.

12. 3 is — — of 12.

13. 4 squares are contained in 12 squares — times.

14. 3 squares are contained in 12 squares — times.

15.  $\frac{1}{3}$  of 12 squares is — squares.  $\frac{2}{3}$  of 12 squares are — squares.

16.  $\frac{1}{4}$  of 12 squares is — squares.  $\frac{3}{4}$  of 12 squares are — squares.

17. Write in order 1, 2, 3, and so on to 20.

18. Write in order 2 tens = 20, 3 tens = 30, 4 tens = 40, and so on to 10 tens = 100. One hundred.

*Copy and learn :*

19. 2 ones are \_\_\_\_.

2 twos are \_\_\_\_.

2 threes are \_\_\_\_.

2 fours are \_\_\_\_.

2 fives are \_\_\_\_.

2 sixes are \_\_\_\_.

2 sevens are \_\_\_\_.

2 eights are \_\_\_\_.

2 nines are \_\_\_\_.

2 tens are \_\_\_\_.

20. 3 ones are \_\_\_\_.

3 twos are \_\_\_\_.

3 threes are \_\_\_\_.

3 fours are \_\_\_\_.

3 fives are \_\_\_\_.

4 ones are \_\_\_\_.

4 twos are \_\_\_\_.

4 threes are \_\_\_\_.

4 fours are \_\_\_\_.

4 fives are \_\_\_\_.

21. A family bought 2 loaves of bread on Monday, 1 loaf on Tuesday, 3 loaves on Wednesday, 1 loaf on Thursday, 3 loaves on Friday, and 3 loaves on Saturday. They bought in all \_\_\_\_ loaves.

22. A boy having 8 cents, received 3 cents from his mother, 4 cents from his father, and then spent 5 cents. He then had \_\_\_\_ cents.

23. A child paid 10 cents each for 4 little chickens. They cost him \_\_\_\_ cents.

24. A girl paid 2 cents apiece for 5 apples and 3 cents apiece for 2 pears. She paid \_\_\_\_ cents in all.

25. Beginning at 1, count by 4's to 41.

26. Beginning at 5, count by 5's to 40.

**X. ADDITION, SUBTRACTION, TENS**

1. Beginning at 4, count by 5's to 39.

2. Beginning at 3, count by 5's to 38.

*Add:*

$$\begin{array}{r}
 34 \\
 25 \\
 \underline{13} \\
 12 \\
 6 \\
 \hline
 72
 \end{array}$$

Add the right-hand column, thus: 8, 12.  
 Add the tens' column, thus: 3, 6 tens. 12 and 6 tens are 72.

*Add:*

3. 12	4. 11	5. 31	6. 13	7. 25
13	32	34	22	14
14	43	15	33	12
<u>15</u>	<u>12</u>	<u>13</u>	<u>15</u>	<u>13</u>
8. 25	9. 17	10. 29	11. 11	12. 21
23	15	12	22	12
<u>27</u>	<u>15</u>	<u>15</u>	<u>49</u>	<u>39</u>
13. 28	14. 17	15. 27	16. 37	17. 12
32	18	28	38	13
<u>14</u>	<u>22</u>	<u>32</u>	<u>22</u>	<u>74</u>

*Subtract:*

$$\begin{array}{r}
 811 \\
 91 \\
 \underline{29} \\
 62
 \end{array}$$

91 = 8 tens and 11.  
 9 from 11 leave 2.  
 2 tens from 8 tens leave 6 tens.



*Subtract :*

$$\begin{array}{r} 18. \ 91 \\ \underline{28} \end{array}$$

$$\begin{array}{r} 19. \ 82 \\ \underline{28} \end{array}$$

$$\begin{array}{r} 20. \ 71 \\ \underline{39} \end{array}$$

$$\begin{array}{r} 21. \ 62 \\ \underline{28} \end{array}$$

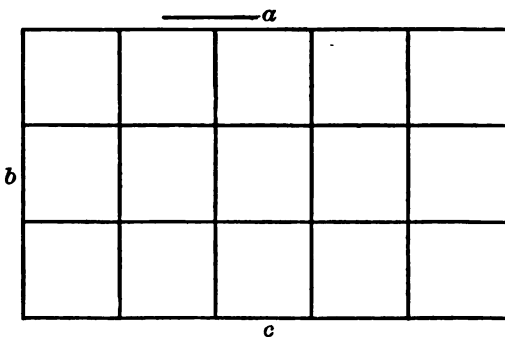
$$\begin{array}{r} 22. \ 42 \\ \underline{18} \end{array}$$

$$\begin{array}{r} 23. \ 63 \ 73 \ 83 \\ \underline{29} \ \underline{29} \ \underline{29} \end{array}$$

$$\begin{array}{r} 24. \ 43 \ 93 \ 73 \\ \underline{28} \ \underline{28} \ \underline{28} \end{array}$$

**XI. MULTIPLICATION AND DIVISION**

1. Taking  $a$  as the unit of length, make a rectangle 5 units long and 3 units wide.



2. Divide it into squares, each as long as unit  $a$ .

3. Along the end  $b$  are — squares in a row.

4. There are — such rows.

5. In the whole rectangle there are — times 3 squares or — squares.

6. Along the side  $c$  are — squares in a row.

7. There are — such rows.

8. In the whole rectangle there are — times 5 squares or — squares.

9. To contain 15 square units, a rectangle 3 units wide must be — units long.

10. To contain 15 square units, a rectangle 5 units long must be — units wide.

11. 3 times 5 are —. 5 times 3 are —.

12. How many 3-squares in the rectangle?  $15 \div 3 =$  —.

13. How many 5-squares in the rectangle?  $15 \div 5 =$  —.

14. 5-squares are — — of the rectangle. 5 is — — of 15.

15. 3-squares are — — of the rectangle. 3 is — — of 15.

## DRILL

*Add:*

$$\begin{array}{r} 16. \quad 11 \quad 12 \quad 21 \\ \quad 12 \quad 15 \quad 13 \\ \quad 13 \quad 27 \quad 18 \\ \quad \underline{10} \quad \underline{14} \quad \underline{32} \end{array}$$

$$\begin{array}{r} 17. \quad 21 \quad 15 \quad 16 \\ \quad 12 \quad 15 \quad 16 \\ \quad 32 \quad 15 \quad 26 \\ \quad \underline{23} \quad \underline{25} \quad \underline{36} \end{array}$$

$$\begin{array}{r} 18. \quad 56 \quad 12 \quad 13 \\ \quad 17 \quad 65 \quad 28 \\ \quad \underline{12} \quad \underline{18} \quad \underline{46} \end{array}$$

$$\begin{array}{r} 19. \quad 19 \quad 63 \\ \quad 27 \quad 19 \\ \quad \underline{13} \quad \underline{12} \end{array}$$

$$\begin{array}{r} 20. \quad 18 \quad 23 \quad 27 \\ \quad 37 \quad 24 \quad 37 \\ \quad \underline{13} \quad \underline{35} \quad \underline{13} \end{array}$$

*Subtract: \**

$$\begin{array}{r} 21. \quad 84 \quad 74 \quad 94 \\ \quad \underline{29} \quad \underline{29} \quad \underline{39} \end{array}$$

$$\begin{array}{r} 22. \quad 53 \quad 64 \\ \quad \underline{27} \quad \underline{38} \end{array}$$

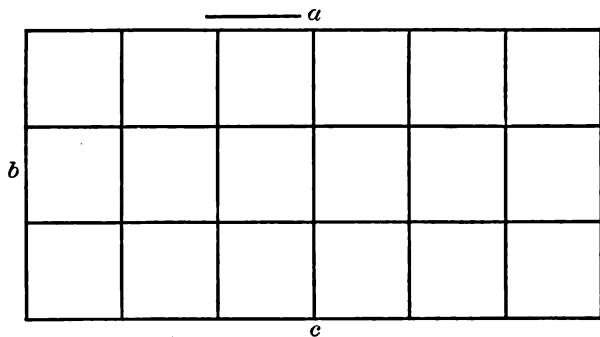
$$\begin{array}{r} 23. \quad 78 \quad 84 \\ \quad \underline{58} \quad \underline{28} \end{array}$$

$$\begin{array}{r} 24. \quad 92 \quad 82 \quad 81 \\ \quad \underline{29} \quad \underline{29} \quad \underline{39} \end{array}$$

$$\begin{array}{r} 25. \quad 83 \quad 82 \\ \quad \underline{24} \quad \underline{38} \end{array}$$

$$\begin{array}{r} 26. \quad 42 \quad 52 \\ \quad \underline{28} \quad \underline{48} \end{array}$$

\* Teach pupils to think, taking the 21st example, — 84 less 20 are 64; 64 less 9 are 55. After all have been done in this way, the pupils may solve in the usual way with pencils.

XII.  $3 \times 6$ 

1. Using  $a$  as a unit of length, make a rectangle 6 units long and 3 units wide.
  2. Divide it into squares, each as long as  $a$ .
  3. Along  $b$  there are — squares in a row.
  4. There are — such rows.
  5. In all there are — times — squares, or — squares.
  6. Along  $c$  there are — squares in a row.
  7. There are — such rows.
  8. In all there are — times — squares, or — squares.
  9. To contain 18 square units, a rectangle 3 units wide must be — units long.
  10. To contain 18 square units, a rectangle 6 units long must be — units wide.
- times 6 are —.      6 times 3 are —.

12. How many times 3 squares in the rectangle?  
 $18 \div 3 = \text{---}$ .

13. How many times 6 squares in the rectangle?  
 $18 \div 6 = \text{---}$ .

14. 6 squares are  $\text{---}$   $\text{---}$  of the rectangle. 6 is  
 $\text{---}$   $\text{---}$  of 18.

15. 3 squares are  $\text{---}$   $\text{---}$  of the rectangle. 3 is  
 $\text{---}$   $\text{---}$  of 18.

DRILL

*Add : \**

16.	17.	18.	19.	20.	21.	22.	23.	24.
1	2	3	4	3	5	10	4	6
2	2	3	2	2	5	20	3	6
3	3	3	3	2	3	30	7	6
2	4	2	4	2	3	14	7	5
2	2	2	1	5	4	3	7	5
3	1	2	2	5	4	5	2	4
3	3	1	4	4	2	1	3	4
4	2	1	4	4	2	1	5	3
<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>

*Subtract :*

25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.
16	14	12	18	20	30	35	46	57	69	73
8	7	6	9	10	20	20	30	39	9	21
<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>

36. 18 apples are divided equally among 3 children.  
 Each child receives  $\text{---}$  apples.

\* Lead pupils to think only the results. As, taking the 16th example, do not say 4 and 3 are 7, but think 7, 10, 12, 14, 17, 19, 20.

**XIII.  $3 \times 7$**  $a$ 

1. Using line  $a$  as the unit of length, make a rectangle 3 by 7.

2. Divide it into squares, each as long as the unit of length,  $a$ .

3. Call one end  $b$  and one side  $c$ .

4. Along the end  $b$  are — squares in a row.

5. There are — such rows.

6. In all there are — times — squares, or — squares.

7. Along the side  $b$  there are — squares in a row.

8. There are — such rows.

9. In all there are — times — squares, or — squares.

10. To contain 21 square units, a rectangle 3 units wide must be — units long.

11. To contain 21 square units, a rectangle 7 units long must be — units long.

12. 3 times 7 are —. 7 times 3 are —.

13. How many 3-squares in the rectangle?  $21 \div 3$   
= —

many 7-squares in the rectangle?  $21 \div 7$

15. 7 squares are ——— of the rectangle. 7 is  
 ——— of 21.

16. 3 squares are ——— of the rectangle. 3 is  
 ——— of 21.

## DRILL

*Find sums : \** (Add)

17.	18.	19.	20.	21.	22.	23.	24.	25.
1	2	3	3	3	4	9	8	7
2	1	2	4	5	3	9	8	7
3	3	4	2	2	2	2	3	2
9	8	7	1	6	5	2	3	3
<u>9</u>	<u>8</u>	<u>7</u>	<u>9</u>	<u>6</u>	<u>5</u>	<u>2</u>	<u>3</u>	<u>6</u>

*Find differences : †* (Subtract)

26.	27.	28.	29.	30.	31.	32.	33.
98	97	96	95	94	93	92	96
<u>27</u>	<u>28</u>	<u>29</u>	<u>36</u>	<u>47</u>	<u>58</u>	<u>59</u>	<u>69</u>
34.	35.	36.	37.	38.	39.	40.	41.
91	89	90	87	86	85	84	83
<u>29</u>	<u>37</u>	<u>36</u>	<u>29</u>	<u>49</u>	<u>27</u>	<u>35</u>	<u>69</u>
42.	43.	44.	45.	46.	47.	48.	49.
82	81	80	79	78	77	76	75
<u>33</u>	<u>34</u>	<u>35</u>	<u>36</u>	<u>37</u>	<u>38</u>	<u>39</u>	<u>48</u>

\* Lead pupils to think results. As, taking example 17, the pupil should not say 9 and 9 are 18, but he should think 18, 21, 23, 24.

† In solving these examples lead pupils to think thus, taking the 26' 98 less 20 = 78; 78 less 7 = 71. Then allow pencils.

XIII.  $3 \times 7$  $a$ 

1. Using line  $a$  as the unit of length, make a rectangle 3 by 7.
2. Divide it into squares, each as long as the unit of length,  $a$ .
3. Call one end  $b$  and one side  $c$ .
4. Along the end  $b$  are — squares in a row.
5. There are — such rows.
6. In all there are — times — squares, or — squares.
7. Along the side  $b$  there are — squares in a row.
8. There are — such rows.
9. In all there are — times — squares, or — squares.
10. To contain 21 square units, a rectangle 3 units wide must be — units long.
11. To contain 21 square units, a rectangle 7 units long must be — units long.
12. 3 times 7 are —. 7 times 3 are —.
13. How many 3-squares in the rectangle?  $21 \div 3$   
= —.
14. How many 7-squares in the rectangle?  $21 \div 7$   
= —.

15. 7 squares are ——— of the rectangle. 7 is  
 ——— of 21.

16. 3 squares are ——— of the rectangle. 3 is  
 ——— of 21.

## DRILL

*Find sums : \** (Add)

17.	18.	19.	20.	21.	22.	23.	24.	25.
1	2	3	3	3	4	9	8	7
2	1	2	4	5	3	9	8	7
3	3	4	2	2	2	2	3	2
9	8	7	1	6	5	2	3	3
<u>9</u>	<u>8</u>	<u>7</u>	<u>9</u>	<u>6</u>	<u>5</u>	<u>2</u>	<u>3</u>	<u>6</u>

*Find differences : †* (Subtract)

26.	27.	28.	29.	30.	31.	32.	33.
98	97	96	95	94	93	92	96
<u>27</u>	<u>28</u>	<u>29</u>	<u>36</u>	<u>47</u>	<u>58</u>	<u>59</u>	<u>69</u>
34.	35.	36.	37.	38.	39.	40.	41.
91	89	90	87	86	85	84	83
<u>29</u>	<u>37</u>	<u>36</u>	<u>29</u>	<u>49</u>	<u>27</u>	<u>35</u>	<u>69</u>
42.	43.	44.	45.	46.	47.	48.	49.
82	81	80	79	78	77	76	75
<u>33</u>	<u>34</u>	<u>35</u>	<u>36</u>	<u>37</u>	<u>38</u>	<u>39</u>	<u>48</u>

\* Lead pupils to think results. As, taking example 17, the pupil should not say 9 and 9 are 18, but he should think 18, 21, 23, 24.

† In solving these examples lead pupils to think thus, taking the 26th, 98 less 20 = 78; 78 less 7 = 71. Then allow pencils.



## XIV. TENS

Multiply 35 by 2.

35 2 5's are 10.

2 2 times 3 tens are 6 tens.

10 6 tens and 10 are 70. The 6 tens may be added mentally without writing.

$$\begin{array}{r} 6 \\ 35 \\ \hline 70 \end{array}$$

*Find products :*

34.	35.	36.	37.				38.			
15	15	15	15	16	16	16	16	16	17	17
2	3	4	6	2	3	4	5	6	2	3
<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>
39.	17	17	18	18	40.	18	18	19	19	
	4	5	2	3		4	5	2	3	
	<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>		<u>  </u>	<u>  </u>	<u>  </u>	<u>  </u>	

Divide 51 by 3.

3)51 51 = 3 tens and 21.

17  $\frac{1}{3}$  of 3 tens is 1 ten.  $\frac{1}{3}$  of 21 is 7.

NOTE. — This may mean, find  $\frac{1}{3}$  of 51, or find how many 3's in 51. Require pupils to tell both meanings in finding the quotients in the following.

*Find quotients :*

41.	2)30	3)45	4)60	5)75	42.	6)90	2)32	3)48
43.	5)80	6)96	2)34	3)51	44.	4)68	5)85	2)36
45.	3)54	4)72	5)90	5)80	46.	2)38	3)57	2)54

## XV. NUMBERS TO 1000

1. We have learned that 10 ones are 1 ten, and that 10 tens are 1 hundred (100).  $\square^a$

2. If we call  $a$  1, what shall we name  $b$ ? What shall we name  $c$ ?

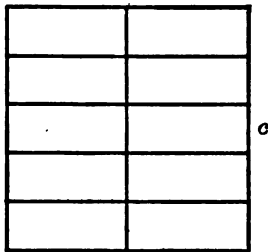


3.  $a$  is equal to — of  $b$ .  
 $b$  is equal to — of  $c$ .

4.  $b$  is equal to —  $a$ 's.  $c$  is equal to —  $b$ 's.

5.  $c$  is equal to —  $a$ 's.

6.  $b$  is contained in  $c$  — times.  
 $a$  is contained in  $b$  — times.



7.  $a$  is contained in  $c$  — times.

8. 1 is contained in 1 ten — times.

9. 10 is contained in 1 hundred — times.

10. 1 is contained in 1 hundred — times.

11. Write in figures one hundred, two hundred, three hundred, and so on to nine hundred. Ten hundred we call one thousand (1000).

12. 3 tens and 6 =  $30 + 6$ , or 36.

13. 2 hundreds, 3 tens, and 6 =  $200 + 30 + 6$ , or 236.

14. 3 hundreds, 5 tens, and 8 =  $\frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad}$ , or  $\frac{\quad}{\quad}$ .

15. 4 hundreds, 4 tens, and 3 =  $\frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad}$ , or  $\frac{\quad}{\quad}$ .

15. What part of  $d$  is equal to  $b$ ?
16.  $d$  is equal to how many times  $a$ ?
17.  $c$  is equal to how many times  $d$ ?
18. If  $d$  represents \$4, what does  $c$  represent?  $b$ ?  $a$ ?
19. Compare  $a$  with each of the other figures.  $a$  equals  $\frac{b}{2}$  (read  $\frac{1}{2}$  of  $b$ ).  $a$  equals  $\frac{c}{8}$ .  $a$  equals  $\frac{d}{4}$ .
20. Compare  $b$  with each of the other figures.
21. Compare  $c$  with each of the other figures.
22. Compare  $d$  with each of the other figures.
23. 2 is the relation of — to  $d$ .
24. 4 is the relation of — to  $a$ .
25. 8 is the relation of — to  $a$ .
26.  $\frac{1}{2}$  is the relation of — to  $b$ .
27.  $\frac{1}{2}$  is the relation of — to  $d$ .
28.  $\frac{1}{2}$  is the relation of — to  $c$ .
29.  $\frac{1}{4}$  is the relation of — to  $d$ .

## DRILL

*Add:*

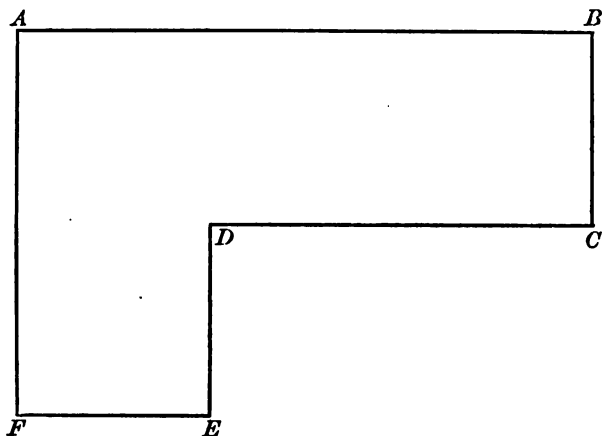
30. 200	31. 150	32. 229	33. 684
100	350	151	239
300	250	216	48
<u>200</u>	<u>249</u>	<u>183</u>	<u>6</u>

*Multiply:*

34. 34	35. 92	36. 28	37. 26	38. 27
<u>3</u>	<u>2</u>	<u>4</u>	<u>5</u>	<u>4</u>

**XVII. COMPUTATIONS FROM A DRAWING MADE  
TO A SCALE**

This figure is a plan of a plot of ground drawn to the scale, 1 inch to 9 feet; that is, 1 inch in length in the



drawing represents 9 feet in length of the corresponding line in the plot.

1. How many feet from *A* to *F*?
2. How many feet from *A* to *B*?
3. How many feet from *B* to *C*?  
From *C* to *D*?  
From *D* to *E*?  
From *E* to *F*?
4. How many feet would a person have to go in walking once around the lot? How many inches would a fly have to go in walking once around the drawing?

5. How many yards from  $A$  to  $B$ ? (3 feet in 1 yard.)  
 How many yards from  $B$  to  $C$ ?  
 How many yards from  $C$  to  $D$ ?
6. How many yards around the plot?

*Subtract:*

$$\begin{array}{r} 215 \\ 835 \end{array} \quad 35 = 2 \text{ tens and } 15.$$

$$\begin{array}{r} 216 \\ 619 \end{array} \quad 6 \text{ from } 15 \text{ leave } 9.$$

$$\begin{array}{r} 619 \\ 584 \end{array} \quad 1 \text{ ten from } 2 \text{ tens leaves } 1 \text{ ten.}$$

$$\begin{array}{r} 723 \\ 139 \end{array} \quad 23 = 1 \text{ ten and } 13.$$

$$\begin{array}{r} 139 \\ 584 \end{array} \quad 9 \text{ from } 13 \text{ leave } 4.$$

$$\begin{array}{r} 723 \\ 139 \\ 584 \end{array} \quad 710 = 6 \text{ hundreds and } 11 \text{ tens.}$$

$$3 \text{ tens from } 11 \text{ tens leave } 8 \text{ tens.}$$

$$1 \text{ hundred from } 6 \text{ hundreds leaves } 5 \text{ hundreds.}$$

### DRILL

*Subtract:*

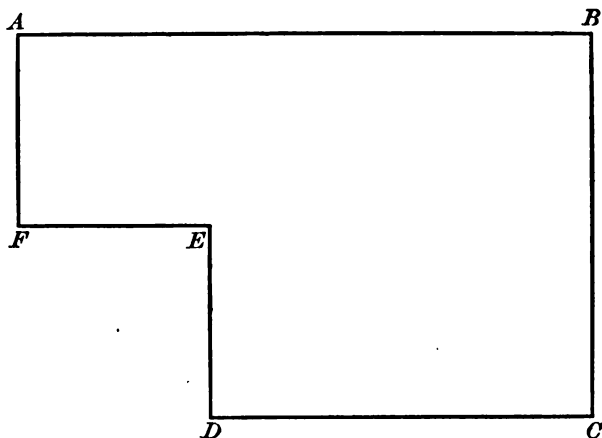
7.	8.	9.	10.	11.	12.	13.
842	238	843	967	863	917	624
<u>164</u>	<u>119</u>	<u>128</u>	<u>189</u>	<u>149</u>	<u>129</u>	<u>184</u>
14.	15.	16.	17.	18.	19.	20.
609	743	312	841	68	68	75
<u>242</u>	<u>438</u>	<u>184</u>	<u>237</u>	<u>3</u>	<u>4</u>	<u>2</u>

*Add:*

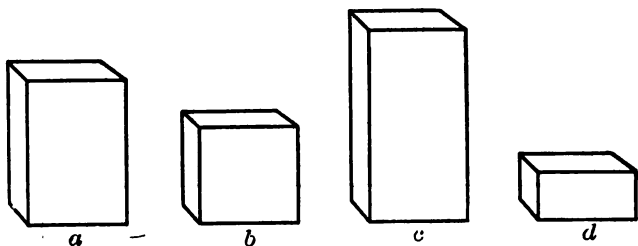
21.	22.	23.	24.	25.	26.	27.
245	128	105	107	86	75	69
128	619	218	694	92	67	80
<u>241</u>	<u>114</u>	<u>149</u>	<u>139</u>	<u>48</u>	<u>43</u>	<u>46</u>

## XVIII. SCALE AND MAGNITUDES

Scale, 1 inch to 12 feet,



1. How many feet from  $A$  to  $B$ ?
2. How many feet from  $B$  to  $C$ ?
3. How many feet from  $C$  to  $D$ ?  
From  $D$  to  $E$ ?  
From  $E$  to  $F$ ?  
From  $F$  to  $A$ ?
4. How many feet in the whole perimeter?
5. How many yards in the perimeter?
6. How many more feet in the side  $AB$  than in the side  $BC$ ?
7. How many more feet in the side  $FE$  than in the side  $ED$ ?



8. If  $c$  is 1, how much is  $b$ ?  $d$ ?  $a$ ?

9. If  $c$  represents 1 pound,  $b$  represents — of a pound, or — ounces. (1 pound = 16 ounces.)

10.  $d$  represents — of a pound, or — ounces.

11.  $a$  represents — of a pound, or — ounces.

12.  $\frac{1}{4}$  is the relation of — to  $c$ , or — ounces to 1 pound.

13.  $\frac{3}{4}$  is the relation of — to  $c$ , or — ounces to 1 pound.

14.  $\frac{1}{2}$  is the relation of — to  $c$ , or — ounces to 1 pound.

#### DRILL

*Subtract:*

$$\begin{array}{r} 15. \ 147 \\ \underline{108} \end{array}$$

$$\begin{array}{r} 16. \ 841 \\ \underline{158} \end{array}$$

$$\begin{array}{r} 17. \ 859 \\ \underline{264} \end{array}$$

$$\begin{array}{r} 18. \ 871 \\ \underline{208} \end{array}$$

*Multiply:*

$$\begin{array}{r} 19. \ 45 \\ \underline{3} \end{array}$$

$$\begin{array}{r} 20. \ 45 \\ \underline{4} \end{array}$$

$$\begin{array}{r} 21. \ 45 \\ \underline{5} \end{array}$$

$$\begin{array}{r} 22. \ 45 \\ \underline{6} \end{array}$$

*Divide:*

$$23. \ 3 \overline{)297} \quad \text{Change 297 to 27 tens and 27.}$$

$$24. \ 3 \overline{)264}$$

$$25. \ 3 \overline{)231}$$

$$26. \ 3 \overline{)444}$$

**XIX. RECTANGLES**

1. Find the area of a rectangle 4 ft. wide and 6 ft. long.
2. Find its perimeter. (The distance around it.)
3. Find the area of a rectangle 5 ft. by 6 ft.
4. Find its perimeter.
5. How much greater is the area of the one than that of the other?
6. How much greater perimeter has the one than the other?
7. What is the perimeter of a table 4 feet square?
8. What is its area?
9. At 16¢ a half pound, what is the cost of  $\frac{1}{4}$  lb. of coffee?
10. At 8¢ a  $\frac{1}{4}$  lb., what is the cost of  $\frac{1}{2}$  lb. of tea? Of  $\frac{3}{4}$  lb.? Of 1 lb.?
11. If 4 oz. (ounces) of butter cost 10¢, what will  $\frac{1}{2}$  lb. cost?  $\frac{3}{4}$  lb.? 1 lb.?
12. If 1 gallon of molasses cost 72¢, what will 1 quart cost? (1 gal. = 4 qt.)
13. If  $\frac{1}{2}$  gal. of molasses cost 28¢, what will 1 qt. cost? 1 pint? (1 qt. = 2 pt.)
14. If a dozen books cost \$ 8, what will 6 books cost?



15. *Add:*

11  
147 12, 19. The 9 ones may be written under the ones, and the 1 ten above the tens' column.

239 9, 13, 14. The 4 tens may be written under the tens' column, and the 1 hundred above the hundreds' column.  
463  
849

6, 7, 8. The answer is 849.

## DRILL

*Add:*

16. 365	17. 563	18. 180	29. 2	30. 2
278	159	205	2	2
<u>149</u>	<u>48</u>	<u>107</u>	2	1
			2	2
2)578	Change 578 to 4 hundreds, 16 tens, and 18 ones.		2	2
<u>289</u>			2	1
			2	2
There are 200 2's in 4 hundreds, 80 2's in 16 tens, and 9 2's in 18. 200 and 80 and 9 are 289.			2	2
			2	2
19. 2)196	24. 3)576		2	1
			2	2
20. 2)372	25. 3)474		2	2
			2	2
21. 2)594	26. 3)192		2	2
			2	1
22. 2)728	27. 3)789		2	2
			1	2
23. 3)213	28. 3)588			

See if you can add each column shown above in 10 seconds. Name only the results as you add; as 3, 5, 7, 9, etc. First add up, then add down.

## XX. DRAWING TO A SCALE

1. Draw a rectangle to represent a plot of ground 12 ft. long and 8 ft. wide. Scale, 1 inch to 4 ft.

12 ft. are ——— times 4 ft. 8 ft. are ——— times 4 ft.

1 inch represents 4 ft.

—— inches will represent 12 ft.

—— inches will represent 8 ft.

2. What is the area of your drawing? (How many square inches?) The area of the plot of ground?

3. What is the perimeter of your drawing? The perimeter of the plot of ground?

4. What is the area of a plot of ground 5 yards by 7 yards? (Rectangle.)

5. The area of a rectangle 3 yards wide is 24 square yards. Its length is ——— yards.

6. The perimeter of a square is 20 feet? How long is the square?

7. The area of the square is ——— square feet.

8. One side of a square is 6 yards. Its area is ——— square yards. Its perimeter is ——— yards.

## DRILL

Add:

9. 33	10. 13	11. 15	12. 372	13. 23	14. 94
34	25	16	496	14	196
22	37	17	139	24	271
<u>14</u>	<u>63</u>	<u>18</u>	<u>101</u>	<u>15</u>	<u>18</u>

*Subtract :*

15.	16.	17.		Change 4 hundreds to 3 hundreds and 10 tens.
611	913	523	$\begin{array}{r} 3910 \\ 400 \end{array}$	
<u>209</u>	<u>247</u>	<u>148</u>	$\begin{array}{r} 145 \\ 255 \end{array}$	Change 10 tens to 9 tens and 10 ones.

18.	19.	20.	21.	22.	23.	24.
500	600	800	700	900	203	801
<u>128</u>	<u>324</u>	<u>235</u>	<u>239</u>	<u>367</u>	<u>189</u>	<u>209</u>

*Multiply :*

25.	26.	27.	28.	29.	30.	31.
34	128	324	324	124	437	385
<u>5</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>5</u>	<u>2</u>	<u>2</u>

32.	33.	34.	35.	36.	37.	38.
325	129	231	127	368	257	49
<u>3</u>	<u>3</u>	<u>4</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>2</u>

39.	40.	41.	42.	43.	44.	45.
409	208	305	107	208	63	94
<u>3</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>5</u>	<u>4</u>	<u>3</u>

46. If 1 horse cost \$375, what would 3 horses cost at the same rate?

47. A farmer paid \$54 for a cow, and sold her for \$62. Find his gain.

48. Practice adding the numbers in Examples 29 and 30 in Lesson 19.

**XXI. SCALE AND MAGNITUDES**

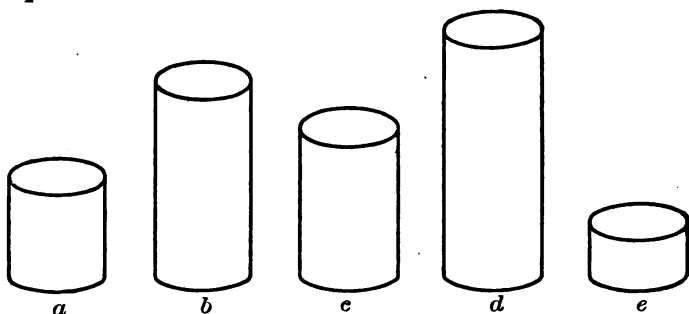
1. Represent a rectangular plot of ground 16 ft. by 20 ft. Scale, 1 inch to 4 ft.

4 ft. are represented by 1 inch.

16 feet are — times 4 feet. 16 feet should be represented by — times 1 inch, or — inches.

20 feet are — times 4 ft. 20 ft. should be represented by — times 1 inch, or — inches.

2. The area of your drawing is — square inches. The perimeter is — inches.



3. If  $a$  is 2,  $b$  is —,  $c$  is —,  $d$  is —, and  $e$  is —.

4.  $c$  equals the sum of  $a$  and —.

5.  $d$  equals the sum of — and —.

6.  $b$  equals the sum of — and —.

7.  $e$  equals the difference of — and —.

8.  $a$  equals the difference of — and —.

9.  $c$  equals the difference of — and —.

10. 2 is the ratio (relation) of  $b$  to —.

11.  $\frac{1}{2}$  is the ratio of  $a$  to —.
12. 3 is the ratio of  $c$  to —.
13.  $\frac{1}{3}$  is the ratio of — to —.
14. 2 is the ratio of  $a$  to —.
15.  $\frac{1}{2}$  is the ratio of — to —.
16. 5 is the ratio of — to —.
17.  $\frac{1}{5}$  is the ratio of — to —.
18. If  $e$  weighs 2 lb.,  $a$  weighs — lb.,  $b$  weighs — lb.,  $c$  weighs — lb., and  $d$  weighs — lb.
19. If  $a$  weighs 6 lb.,  $b$  weighs — lb.,  $c$  weighs — lb., and  $d$  weighs — lb.
20. If  $b$  costs 16¢,  $a$  costs —¢,  $c$  costs —¢,  $d$  costs —¢, and  $e$  costs —¢.

*Find products :*

DRILL

- |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|
| 21. 235  | 235      | 22. 136  | 136      | 23. 147  | 147      |
| <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>3</u> | <u>4</u> |

*Find quotients : \**

- |           |       |           |       |           |       |
|-----------|-------|-----------|-------|-----------|-------|
| 24. 5)170 | 2)256 | 25. 2)648 | 3)972 | 26. 5)620 | 2)874 |
| 27. 2)470 | 3)705 | 28. 4)544 | 5)680 | 29. 3)441 | 4)588 |

30. Make concrete examples of the examples in the 21st and 26th exercises.

31. Practice Examples 29 and 30 in Lesson 19.

\* Pupils should give both meanings of the division examples. It may not be necessary to give both meanings to all.

**XXII. APPLICATIONS**

1. If 2 lb. of tea cost 98 cents, 1 lb. will cost — cents, and 5 lb. will cost — cents.
2. If five sheep cost 35 dollars, what will 4 sheep cost?
3. If 3 horses cost 270 dollars, what will 5 horses cost?
4. If 6 quarts of berries cost 60¢, what will 4 quarts cost?
5. If 2 gallons of molasses cost 120¢, what will  $\frac{1}{2}$  gallon cost?
6. If 2 quarts of molasses cost 50¢, what will 1 gallon cost?
7. A quart of vinegar cost 6¢. Find the cost of a gallon.
8. If  $\frac{1}{2}$  gallon of molasses cost 30¢, what will 4 gallons cost?
9. A boy lives 80 yards from the school. How many feet? If he goes 2 feet every step, how many steps must he take to go and return?
10. A man driving 8 miles an hour must take — hours to go 24 miles.
11. A man driving 7 miles an hour for 4 hours will go — miles.
12. A man who goes 30 miles in 6 hours must travel at the average rate of — miles an hour.

## DRILL

*Find sums :*

13.	14.	15.	16.	17.	18.
49	17	30	25	96	45
24	28	47	37	87	15
63	35	60	42	49	37
<u>12</u>	<u>42</u>	<u>81</u>	<u>93</u>	<u>34</u>	<u>42</u>

*Find differences :*

19.	20.	21.	22.	23.	24.
18	831	594	607	811	900
<u>9</u>	<u>173</u>	<u>209</u>	<u>295</u>	<u>247</u>	<u>248</u>

*Find products :*

25.	26.	27.	28.	29.
28	149	149	149	227
<u>5</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>2</u>

*Find quotients :*

30.	31.	32.	33.	34.	35.
5) <u>140</u>	3) <u>447</u>	4) <u>596</u>	5) <u>745</u>	2) <u>454</u>	3) <u>681</u>
36.	37.	38.	39.	40.	41.
3) <u>441</u>	4) <u>588</u>	5) <u>735</u>	2) <u>518</u>	3) <u>777</u>	3) <u>636</u>
42.	43.	44.	45.	46.	47.
5) <u>855</u>	5) <u>656</u>	3) <u>285</u>	2) <u>192</u>	3) <u>108</u>	4) <u>136</u>
48.	49.	50.	51.	52.	53.
4) <u>196</u>	4) <u>192</u>	4) <u>184</u>	4) <u>188</u>	4) <u>256</u>	4) <u>268</u>

54. Make concrete examples of the 13th, 19th, 25th, and 30th examples.

**XXIII. THE PRINCIPLES OF ADDITION, SUBTRACTION,  
AND MULTIPLICATION**

1. The sum of two numbers is 15; one of the numbers is 8; the other number is —.

2. The sum of two numbers is 13; one of the numbers is 9; the other number is —.

3. The difference of two numbers is 3; the less number is 4; the greater is —.

4. The difference of two numbers is 2; the less number is 6; the greater is —.

5. The difference of two numbers is 4; the greater number is 9; the less is —.

6. The difference of two numbers is 5; the greater number is 8; the less is —.

7. The product of two numbers is 21; one of the numbers is 3; the other is —.

8. The product of two numbers is 18; one of the numbers is 2; the other is —.

9. At 24¢ a peck, 1 qt. of peas will cost — cents.  
(1 peck = 8 quarts.)

10. At 40¢ a quart, a half peck of peas will cost — cents.

11. A half bushel of wheat costs 40¢.  $\frac{1}{4}$  bushel costs — cents. 1 bushel costs — cents.

12. A peck of potatoes costs 25¢. A bushel costs —¢.  
(1 bushel = 4 pecks.)



13. If a half bushel of potatoes cost 40¢, what will a peck cost?

14. Find the cost of a half bushel of potatoes at 25¢ a peck.

15.  $\frac{1}{2}$  bu. and  $\frac{1}{4}$  bu. are — pecks. (bu. = bushel.)

16.  $\frac{1}{2}$  bu. less  $\frac{1}{4}$  bu. is — peck.

17. 1 bu. and 2 pecks are — pecks.

18. 2 bu. and 3 pecks are — pecks.

19. 8 pk. and 2 bu. are — bushels.

### DRILL

*Find sums:*

$$\begin{array}{r} 20. \quad 347 \quad 507 \\ \quad \underline{269} \quad \underline{279} \end{array}$$

$$\begin{array}{r} 21. \quad 179 \quad 750 \\ \quad \underline{393} \quad \underline{194} \end{array}$$

$$\begin{array}{r} 22. \quad 532 \quad 625 \\ \quad \underline{179} \quad \underline{208} \end{array}$$

*Find differences:*

$$\begin{array}{r} 23. \quad 616 \quad 616 \\ \quad \underline{269} \quad \underline{347} \end{array}$$

$$\begin{array}{r} 24. \quad 768 \quad 786 \\ \quad \underline{507} \quad \underline{279} \end{array}$$

$$\begin{array}{r} 25. \quad 572 \quad 572 \\ \quad \underline{179} \quad \underline{393} \end{array}$$

$$\begin{array}{r} 26. \quad 944 \quad 944 \\ \quad \underline{750} \quad \underline{194} \end{array}$$

$$\begin{array}{r} 27. \quad 711 \quad 944 \\ \quad \underline{532} \quad \underline{194} \end{array}$$

$$\begin{array}{r} 28. \quad 833 \quad 833 \\ \quad \underline{625} \quad \underline{208} \end{array}$$

*Find products:*

$$\begin{array}{r} 29. \quad 147 \quad 147 \quad 147 \\ \quad \underline{3} \quad \underline{4} \quad \underline{5} \end{array}$$

$$\begin{array}{r} 30. \quad 259 \quad 259 \quad 159 \\ \quad \underline{2} \quad \underline{3} \quad \underline{4} \end{array}$$

$$\begin{array}{r} 31. \quad 192 \quad 197 \quad 197 \\ \quad \underline{2} \quad \underline{3} \quad \underline{4} \end{array}$$

$$\begin{array}{r} 32. \quad 234 \quad 324 \quad 527 \\ \quad \underline{5} \quad \underline{4} \quad \underline{3} \end{array}$$

33. Make concrete examples of the 29th and 30th examples.

## XXIV. DENOMINATE NUMBERS

1. 1 inch is ——— of a foot. (1 foot = 12 inches.)
2. 1 dime equals ——— cents.
3. 1 cent is ——— of a dime.
4. 1 foot and 1 inch are ——— inches.
5. 1 dime and 1 cent are ——— cents.
6. 1 week and 1 day are ——— days.
7. 1 quart and 1 pint are ——— pints.
8. 1 gallon and 1 quart are ——— quarts.
9. 1 half and 1 sixth are ——— sixths.
10. 1 half and 1 third are ——— sixths.
11. 1 half and 1 fourth are ——— fourths.
12. 1 half and 1 eighth are ——— eighths.
13. 1 half and 1 tenth are ——— tenths.
14. 1 half and 1 twelfth are ——— twelfths.
15. I have a string 43 feet long. Charles has one 11 ft. longer. How long is his?
16. Farmer Jones has 23 cows. Farmer Gray has 5 cows less. Farmer Gray has ——— cows.
17. John has 14 books. Mary has 3 times as many. Mary has ——— books.
18. Mother bought 15 yards of silk. Martha bought  $\frac{1}{3}$  as much. Martha bought ——— yards.
19. A quart of milk daily for a week at 5¢ a quart will cost ——— cents.



**XXV. DENOMINATE NUMBERS**

1. 15 inches are one foot and — inches.
2. 14 inches are one foot and — inches.
3. 13 cents are one dime and — cents.
4. 14 cents are one dime and — cents.
5. 8 days are one week and — day.
6. 10 days are one week and — days.
7. 7 pints are — quarts and — pint.
8. 10 quarts are — gallons and — quarts.
9. 12 cents are 2 nickels and — cents.
10. 15 sixths are 2 wholes and — sixths.
11. 9 halves are — wholes and one half.
12. 18 eighths are — wholes and — eighths.
13. 22 tenths are — wholes and — tenths.
14. 26 twelfths are — wholes and — twelfths.
15. John's father weighs 150 pounds, and his uncle weighs 140 pounds. They both weigh — pounds.
16. Mary weighs 84 pounds and her sister 14 pounds less. Her sister weighs — pounds.
17. At 15 cents a gallon, 7 gallons of kerosene will cost — ¢.
18. For 95 cents, how many trips can be taken at 5¢ a trip?
19. 5 packages of equal weight weighed all together 125 pounds. Each package weighed — pounds.

## DRILL

*Add :*

$$\begin{array}{r} 20. \quad 81\frac{1}{4} \quad 15\frac{1}{5} \quad 29\frac{1}{10} \\ \quad \quad 7\frac{3}{4} \quad \quad 7\frac{1}{10} \quad \quad 7\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 21. \quad 36\frac{3}{10} \quad 14\frac{1}{3} \quad 18\frac{4}{5} \\ \quad \quad 4\frac{7}{10} \quad \quad 5\frac{2}{3} \quad \quad 1\frac{1}{5} \\ \hline \end{array}$$

*Subtract :*

$$\begin{array}{r} 22. \quad 48\frac{1}{2} \quad 847\frac{4}{5} \quad 962\frac{2}{3} \\ \quad \quad 13\frac{1}{4} \quad \quad 23\frac{1}{5} \quad \quad 128\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 23. \quad 204\frac{1}{4} \quad 876\frac{6}{10} \quad 502 \\ \quad \quad 19\frac{1}{4} \quad \quad 198\frac{3}{10} \quad \quad 29\frac{1}{3} \\ \hline \end{array}$$

*Multiply :*

$$\begin{array}{r} 24. \quad 84 \quad 96 \quad 79 \\ \quad \quad 3 \quad \quad 2 \quad \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} 25. \quad 69 \quad 78 \quad 67 \\ \quad \quad 4 \quad \quad 4 \quad \quad 2 \\ \hline \end{array}$$

*Divide :*

$$\begin{array}{r} 26. \quad 2)\underline{270} \quad 2)\underline{568} \quad 2)\underline{892} \quad 27. \quad 3)\underline{648} \quad 3)\underline{765} \quad 3)\underline{969} \end{array}$$

28. Practice Examples 27 and 28 in Lesson 24.

This sign  $\times$  may be read "multiplied by."

This sign  $\div$  is read "divided by."

The following examples may be written as those above before solving, or they may be solved as they stand :

$$29. \quad 5\frac{1}{4} + 8\frac{3}{4}.$$

$$35. \quad 65 \times 3.$$

$$30. \quad 17\frac{1}{5} + 5\frac{1}{10}.$$

$$36. \quad 58 \times 3.$$

$$31. \quad 56\frac{1}{2} - 14\frac{1}{4}.$$

$$37. \quad 67 \times 4.$$

$$32. \quad 106\frac{1}{2} - 23\frac{1}{4}.$$

$$38. \quad 246 \div 2.$$

$$33. \quad 84 - 13\frac{1}{3}.$$

$$39. \quad 328 \div 2.$$

$$34. \quad 73 \times 2.$$

$$40. \quad 436 \div 2.$$

## XXVI. DECIMALS, TENTHS

1. One tenth is written two ways, either  $\frac{1}{10}$  or .1.  $3\frac{1}{10}$  may be written 3.1. This may be read 31 tenths, or 3 and 1 tenth.  $4\frac{3}{10}$  equals 4.3. One whole equals 10 tenths. 2 wholes equal — tenths. 3 wholes equal — tenths. 3.1 equal — tenths.

2. 5 wholes equal — tenths. 40 tenths equal — wholes.

3. 23 tenths equal 2 and 3 tenths, or 2.3. 45 tenths equal — and — tenths.

4. 5.4 is read — tenths, or — and — tenths.

5. Write in figures, using the decimal point (.), as above: 7 tenths, 16 tenths, 24 tenths, 67 tenths, 4 and 8 tenths, 3 and 6 tenths, and 5 and 9 tenths.

6. Read these numbers both ways: 5.8, 7.4, 6.5, 8.6, 4.7.

## DRILL

*Read and give the sums of:*

7.			8.			9.		
$5\frac{2}{10}$	6.3	7.2	13.7	8.4	4.3	32.5	8.7	63.2
$1\frac{5}{10}$	<u>2.4</u>	<u>1.9</u>	<u>21.5</u>	<u>3.9</u>	<u>3.9</u>	<u>12.9</u>	<u>4.9</u>	<u>4.8</u>

*Read and give the differences of:*

10.			11.			12.		
$8\frac{6}{10}$	16.4	2.5	24.1	75.3	64.8	69.2	84.3	80.4
$5\frac{3}{10}$	<u>5.2</u>	<u>1.7</u>	<u>18.3</u>	<u>19.5</u>	<u>12.9</u>	<u>14.8</u>	<u>27.1</u>	<u>2.9</u>

*Read and give the products of:*

13.			14.			15.		
$4\frac{3}{10}$	4.3	5.2	7.2	$5\frac{4}{10}$	5.4	$7\frac{3}{10}$	7.3	6.9
<u>2</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>3</u>

*Read and give the quotients of: \**

16.	$2)\underline{8\frac{6}{10}}$	$2)\underline{8.6}$	$3)\underline{15.6}$	17.	$3)\underline{21.6}$	$2)\underline{10\frac{8}{10}}$	$2)\underline{10.8}$
			18.	$2)\underline{14\frac{6}{10}}$	$2)\underline{14.6}$	$3)\underline{20.7}$	

*Multiply:*

19.	67	59	79	20.	73	65	78
	<u>5</u>	<u>4</u>	<u>4</u>		<u>3</u>	<u>3</u>	<u>3</u>

*Divide:*

21.	$4)\underline{728}$	$4)\underline{636}$	$4)\underline{924}$	22.	$4)\underline{812}$	$4)\underline{964}$	$5)\underline{105}$
			23.	$5)\underline{850}$	$5)\underline{955}$	$5)\underline{720}$	

24. At \$ 4.3 each, how much will 2 sheep cost?

25. If 3 hens weigh 15.6 pounds, what is their average weight?

26. Practice Examples 27 and 28 in Lesson 24.

NOTE. — Decimal fractions, or decimals, have the same nature as the fractions already studied. The Latin word "decem" means ten. Therefore, tenths are called decimals.

The pupil should observe the difference in the manner of expressing a common fraction and a decimal. In writing  $\frac{3}{4}$  we write both the 3 and the 4; in writing  $\frac{3}{10}$  we may omit the 10; as, .3.

\* These division exercises should be read in only one way. As,  $\frac{1}{2}$  of  $8\frac{1}{10}$  is  $4\frac{1}{10}$ .

**XXVII. HUNDREDTHS**

1. In one dollar there are 100 cents. 1 cent is — of a dollar.  $\frac{1}{100}$  is also written .01.

2. One dollar and one cent are written \$1.01. Write two dollars and 3 cents, 3 dollars and 4 cents, 3 dollars and 6 cents, 24 dollars and 9 cents.

3. One dollar and 25 cents are written \$1.25. Write 5 dollars and 53 cents, 16 dollars and 29 cents, 18 dollars and 75 cents.

4. 6 cents are — hundredths of a dollar. 25 cents are — hundredths of a dollar.

5. A chair cost \$2.25, a table \$10.35, and a clock \$8.40. How much did they all cost?

\$2.35	For convenience, arrange the numbers so that
10.35	like units shall be in the same column, hundredths
8.40	under hundredths, tenths under tenths, ones under
<hr/> \$21.00	ones, and so on.

6. Add \$16.90, \$5.85, \$7.45, and \$6.42.

7. From \$7.43 take \$4.39.

8. Multiply \$4.62 by 3.

9. Divide \$3.64 by 2.

10. Find the cost of 5 chairs at \$2.35 each.

11. At the rate of 3.5 miles an hour, how far will a man walk in 3 hours?



12. A tradesman took in \$ 6.49 on Monday, \$ 12.62 on Tuesday, and \$ 19.43 on Wednesday. How much all together did he take in during the three days?

13. A man with \$ 5.82 in his pocket spent \$ 2.48. How much had he left?

14. During 5 days a man's expenses were \$ 15.65. What was his average daily expense?

15. For 3 books I paid \$ 8.76. What was the average price per book?

16. Practice Examples 27 and 28 in Lesson 24.

### DRILL

*Add:*

17.	18.	19.	20.	21.	22.
\$ 2.50	\$ 7.62	\$ 5.78	\$ 8.01	\$ 15.01	\$ 3.01
3.75	4.29	4.15	2.09	7.03	.17
<u>4.32</u>	<u>1.46</u>	<u>2.01</u>	<u>.38</u>	<u>4.70</u>	<u>2.18</u>

*Subtract:*

23.	24.	25.	26.
\$ 7.01	\$ 5.09	\$ 4.72	\$ 8.49
<u>3.06</u>	<u>2.08</u>	<u>3.29</u>	<u>2.76</u>
27. \$ 6.49	28. \$ 5.42	29. \$ 0.89	30. \$ .67
<u>.13</u>	<u>2.29</u>	<u>.25</u>	<u>.36</u>

31. Make concrete examples of the 15th and 23d examples.

NOTE.—One tenth of one tenth is one hundredth. Therefore, hundredths are called decimals.

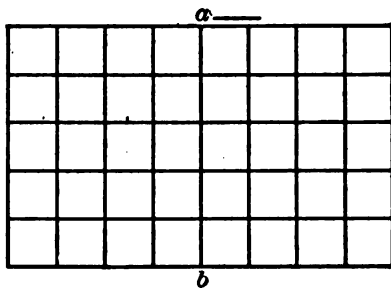
## XXVIII. MULTIPLICATION AND DIVISION

$5 \times 8, 5 \times 9$

1. With  $a$  as the unit of length, draw a rectangle  $5 \times 8$ . (5 by 8.)

2. Divide it into squares, each as long as  $a$ . Call one side  $b$ .

3. Along  $b$  is a row of — squares.



4. There are — such rows.

5. In all there are — squares.

6. 5 times 8 are —.

7. 8 squares are contained in the rectangle — times.

8. 8 is contained in 40 — times.

9. 5 squares are contained in the rectangle — times.

10. 5 is contained in 40 — times.

11.  $\frac{1}{5}$  of 40 squares is — squares.

12.  $\frac{1}{8}$  of 40 squares is — squares.

13. 5 pecks are equal to — quarts.

14. 5 packages of 8 lb. each weigh — pounds.

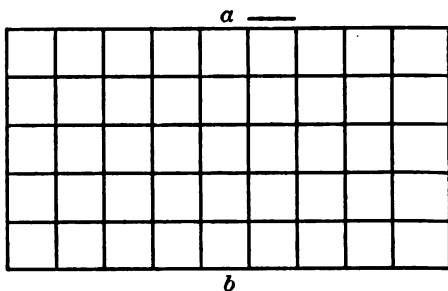
15. If \$40 will pay for 8 sheep, each sheep will cost — dollars.  $\frac{1}{8}$  of \$40 equals —.

16. For \$40, how many yards of silk can be bought at \$5 a yard?  $\$40 \div \$5$  equals —.

17. With  $a$  as the unit of length, draw a rectangle 5 by 9.

18. Divide it into squares, each as long as  $a$ . Call one side  $b$ .

19. Along side  $b$  is a row of — squares.



20. There are — such rows.

21. In all there are — squares.

22. 5 times 9 are —.

23. 9 squares are contained in the rectangle — times.

24. 9 squares are — — of the rectangle.

25. 5 squares are contained in the rectangle — times.

26. 5 squares are — — of the rectangle.

27. 9 is contained in 45 — times.

28. 5 is contained in 45 — times.

29. The car fare for 9 people at 5¢ each is — cents.

30. 45¢ will pay at 5¢ a trip for — trips.

31. 9 rides cost 45¢. 1 ride costs — cents.

32. 5 times 8 are —. 8 times 5 are —.

33. 5 times 9 are —. 9 times 5 are —.

(Require pupils to make the drawings.)

**XXIX. APPLICATIONS**

1. 5 chocolate tablets at 2¢ each will cost — cents.
2. 5 7-lb. packages of sugar weigh — pounds.
3. If 5 persons give 9¢ apiece to a poor child, the child will receive — ¢.
4. 10¢ will buy — 2¢ stamps.
5. 15¢ will buy — 3¢ stamps.
6. 5 5¢ stamps will cost — cents.
7. At \$5 apiece, \$45 will buy — calves.
8. 7 men pay \$35 for a trip to the seashore. Each man pays — dollars.
9. A man hired 7 teams for a day at \$5 a team. He had to pay — dollars.
10. A man bought 5 chairs at \$7 apiece, and sold them at \$9 apiece. He gained — dollars.
11. Find the cost of 5 spoons at \$1.75 apiece.
12. If 5 spoons cost \$8.75, find the cost of each spoon.
13. A dealer bought coal at \$3.75 a ton, and sold it at \$4.20 a ton. He gained \$ —.
14. A dealer bought apples at \$1.75 a barrel and sold them for \$2.25 a barrel. He gained —. What would have been his gain on 5 barrels?
15. A dealer bought 5 tons of coal for \$3.65 a ton, and sold it for \$4.10 a ton. Find his gain.

16. A stationer bought 5 books for \$4.89 each, and sold them for \$5.19 each. He gained \$ —.

17. 2 is the ratio of 8 to —.	25. 3	26. 4
	3	4
18. $\frac{1}{2}$ is the ratio of 8 to —.	3	4
	2	4
19. 3 is the ratio of 6 to —.	2	4
	2	4
20. $\frac{1}{3}$ is the ratio of 6 to —.	2	4
	3	4
21. 4 is the ratio of 8 to —.	3	4
	3	4
22. $\frac{1}{4}$ is the ratio of 8 to —.	1	4
	3	4
23. 5 is the ratio of 10 to —.	2	4
	2	4
24. $\frac{1}{5}$ is the ratio of 10 to —.	1	4
	3	4
Try to add each column in 10	2	4
seconds. First, add up; then, down.	3	1
	—	—

## DRILL

*Multiply:*

27. \$2.06	28. \$8.15	29. \$9.39	30. \$6.75
<u>3</u>	<u>2</u>	<u>3</u>	<u>2</u>
31. \$22.01	32. \$16.25	33. \$7.12	34. \$5.05
<u>2</u>	<u>3</u>	<u>3</u>	<u>3</u>

*Divide:*

35. 3) <u>\$6.18</u>	36. 3) <u>\$16.30</u>	37. 3) <u>\$14.17</u>	38. 2) <u>\$13.50</u>
39. 2) <u>\$44.02</u>	40. 3) <u>\$98.75</u>	41. 3) <u>\$21.36</u>	42. 3) <u>\$15.15</u>

## XXX. MULTIPLICATION AND DIVISION

$$6 \times 6, 6 \times 7$$

1. With  $a$  as the unit of length, draw a square 6 units long.

2. Divide the square into squares, each as long as  $a$ .

3. Along a side there is a row of — small squares.

4. There are — such rows.

5. In all there are — small squares.

6. 6 times 6 are —.

7. 6 squares are contained in 36 squares — times.

8. 6 is — of 36.

9. 12 is — of 36.

10. 18 is — of 36.

11.  $b$  is — of the large square.  $b$  is — of 1 row of squares.

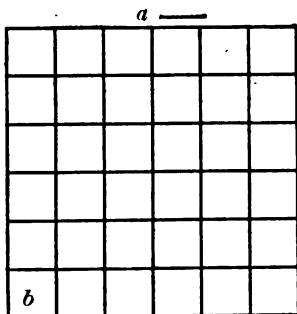
1 row of squares is — of the large square.

$\frac{1}{6}$  of  $\frac{1}{6}$  equals —.

12. 6 calves at \$6 apiece cost — dollars.

13. 6 packages of sugar weighing 6 lb. apiece weigh — pounds.

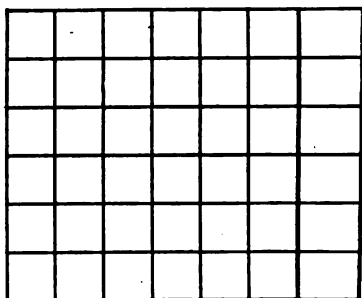
14. A man with his team earned \$36 in 6 days. Each day he earned — dollars.



15. With  $a$  as the unit of length, draw a rectangle 6 by 7.

16. Divide it into squares, each as long as  $a$ . Call one side  $d$ .

17. Along one side  $d$  there are — squares.



18. There are — such rows.

19. In all there are — squares.

20. 6 times 7 are —.

21. 7 squares are contained in 42 squares — times.

22. 7 is — — of 42.

23. 14 is — — of 42.

24. 21 is — — of 42.

25. Find the cost of 6 lb. of sugar at 7¢ a pound; at 6¢ a pound.

26. When spoons cost \$6 a dozen, how many dozen can be bought for \$42? For \$36?

27. How many squares in a row along one end of the last rectangle?

There are — such rows. There are — squares in all.

28. 7 times 6 are —. 6 times 7 are —. 6 times 6 are —.

29. Practice Examples 25 and 26 in Lesson 29.

(Require pupils to make the drawings.)

XXXI. MULTIPLICATION AND DIVISION

$$6 \times 8, 6 \times 9$$

1. With  $a$  as the unit of length, draw a rectangle  $6 \times 8$ .

2. Divide it into squares, each as long as  $a$ . Call one side  $d$ .

3. Along side  $d$  is a row of — squares.

4. There are — such rows.

5. In all there are — squares.

6. 6 times 8 are —.

7. 8 squares are contained in 48 squares — times.

8. 8 is — — of 48.

11. — is 4 sixths of 48.

9. 16 is — — of 48.

12. — is 5 sixths of 48.

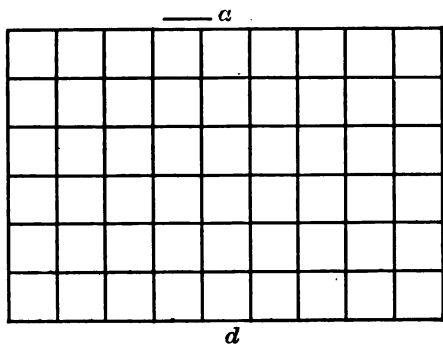
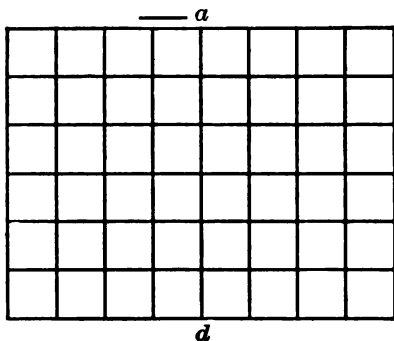
10. — is 3 sixths of 48.

13. — is 6 sixths of 48.

14. With  $a$  as the unit of length, draw a rectangle  $6 \times 9$ .

15. Divide it into squares, each as long as  $a$ . Call one side  $d$ .

16. Along side  $d$  is a row of — squares.





17. There are — such rows.
18. In all there are — squares.
19. 6 times 9 are —.
20. 9 squares are contained in 54 squares — times.
21. 9 is — — of 54.
22. 18 is — — of 54.
23. — is 3 sixths of 54.
24. — is 4 sixths of 54.
25. 6 packages, each weighing 8 pounds, will weigh all together — pounds.
26. 6 sheep cost \$48. Each sheep cost — dollars.
27. 6 chairs at \$9 apiece will cost — dollars.
28. How many trays will carry 54 boxes of cherries, if each tray holds 6 boxes?
29. In the first rectangle there is a row of — squares along one end.
30. There are — such rows. There are — squares in all.
31. 8 times 6 are —.
32. In the second rectangle there is a row of — squares along one end.
33. There are — such rows. There are — squares in all.
34. 9 times 6 are —. 6 times 9 are —. 6 times 8 are —. 8 times 6 are —.

(Require pupils to make the drawings.)

## XXXII. APPLICATIONS

1. At \$2.45 a gallon, what will be the cost of 6 gallons of olive oil?

2. Flour costs \$4.89 a barrel. Find the cost of 5 barrels.

3. If one barrel of flour weighs 196 pounds, what will 5 barrels weigh?

4. At \$2.79 a barrel, what will 6 barrels of potatoes cost?

5. A man bought 6 pounds of steak at 19¢ a pound, and 5 hams at \$1.89 each. How much did his bill amount to?

6. 5 baskets of berries at 9¢ a basket, and 6 lb. of currants at 8¢ a pound will cost how much?

7. For 42¢ I can buy 7 pounds of sugar. What is the price per pound?

8. For 54¢ how many quarts of cherries can I buy at 9¢ a quart?

9. 3 is contained in 14 — times and — over.

10. 3 is contained in 17 — times and — over.

11. 3 is contained in 19 — times and — over.

12. 3 is contained in 23 — times and — over.

13. 3 is contained in 29 — times and — over.

14. 3 is contained in 35 — times and — over.

15. 4 is contained in 14 — times and — over.

16. 4 is contained in 17 — times and — over.

17. 4 is contained in 19 — times and — over.
18. 4 is contained in 29 — times and — over.
19. 4 is contained in 26 — times and — over.
20. 4 is contained in 34 — times and — over.
21. 4 is contained in 38 — times and — over.
22. 5 is contained in 18 — times and — over.
23. 5 is contained in 17 — times and — over.
24. 5 is contained in 27 — times and — over.
25. 5 is contained in 37 — times and — over.
26. 5 is contained in 12 — times and — over.
27. 5 is contained in 22 — times and — over.
28. 5 is contained in 32 — times and — over.
29. 5 is contained in 13 — times and — over.
30. 5 is contained in 23 — times and — over.

## DRILL

*Multiply :*


- |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|
| 31. 169  | 32. 87   | 33. 45   | 34. 139  | 35. 87   | 36. 56   |
| <u>5</u> | <u>5</u> | <u>5</u> | <u>6</u> | <u>6</u> | <u>6</u> |



*Divide :*

- |                   |                   |                   |
|-------------------|-------------------|-------------------|
| 37. 2) <u>836</u> | 38. 3) <u>915</u> | 39. 4) <u>824</u> |
| 40. 5) <u>185</u> | 41. 5) <u>575</u> | 42. 5) <u>240</u> |

43. Practice Examples 25 and 26 in Lesson 29.

## XXXIII. FIFTHS AND TENTHS.

1. In one whole there are — tenths. 

2. In one whole there are — fifths.   


3. In one whole there are — halves.
4. One fifth equals — tenths.
5. One half equals — tenths.
6. One fifth and one tenth are — tenths.
7. One half and one tenth are — tenths.
8. One half and one fifth are — tenths.
9. One fifth less one tenth is — tenth.
10. One half less one fifth is — tenths.
11. One half less two fifths is — tenths.
12. One fifth and three tenths are — tenths.
13. Two times one fifth are — tenths.
14. Two times two fifths are — tenths.
15. Two times three tenths are — tenths.
16. One tenth is contained in one fifth — times.
17. One tenth is contained in one half — times.
18. One tenth is contained in two fifths — times.
19. If one tenth of a thing is worth \$5, one half of it is worth \$ —.
20. If one tenth of a bushel of grain is worth 10 cts., two fifths of a bushel are worth — ¢.

21. If one tenth of Mary's weight is 8 pounds, two fifths of her weight is — pounds.

22. If one tenth of John's weight is 9 lb., two fifths of his weight is — pounds.

# DRILL

*Add:*

$$\begin{array}{r} 23. \quad 8\frac{1}{2} \\ \quad 3\frac{1}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 24. \quad 7\frac{1}{5} \\ \quad 4\frac{1}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 25. \quad 2\frac{1}{2} \\ \quad 5\frac{1}{10} \\ \hline \end{array}$$

32. 4

33. 4

4

4

4

4

4

4

*Subtract:*

$$\begin{array}{r} 26. \quad 12\frac{1}{2} \\ \quad 8\frac{1}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 27. \quad 16\frac{1}{2} \\ \quad 5\frac{1}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 28. \quad 17\frac{1}{5} \\ \quad 9\frac{1}{10} \\ \hline \end{array}$$

4

4

4

4

4

4

4

4

*Multiply:*

$$\begin{array}{r} 29. \quad 15\frac{1}{5} \\ \quad 4 \\ \hline \end{array}$$

$$\begin{array}{r} 30. \quad 28\frac{1}{10} \\ \quad 6 \\ \hline \end{array}$$

$$\begin{array}{r} 31. \quad 49\frac{1}{10} \\ \quad 5 \\ \hline \end{array}$$

4

4

4

4

4

4

4

4

4

4

4

4

2

3

Try to add each column shown above in 10 seconds. Add down; then up.

## XXXIV. MULTIPLICATION AND DIVISION

$$7 \times 7, 7 \times 8$$

$a$

1. With  $a$  as the unit of length, draw a square 7 units long.
2. Divide it into squares, each as long as  $a$ .
3. There are — squares in a row.
4. There are — rows.

5. In all there are — squares.
6. 7 times 7 are —.
7. Each square is — — of the large square.
8. One row of squares is — forty-ninths of the large square.
9. One row of squares is one — of the large square.
10. One seventh equals — forty-ninths.
11. A family using 7 quarts of milk daily will use — quarts in 7 days.
12. A man gave 49 apples to some boys, giving them 7 apples apiece. How many boys were there?
13. In 7 days a man earned \$49. In one day he earned — — of \$49, or — dollars.
14. The sum of 7 and 7 is —. The product of 7 and 7 is —.
15. With  $a$  as the unit of length, draw a rectangle  $7 \times 8$ .
16. Divide it into squares, each as long as  $a$ . Call one side  $b$ .
17. Along side  $b$  is a row of — squares.
18. There are — such rows.
19. In all there are — squares.
20. 7 times 8 are —.
21. 8 squares are contained in the rectangle — times.
22. 8 is contained in 56 — times.

23. A horse which eats 8 quarts of oats a day will eat in a week — times 8 quarts or — quarts.

24. 7 men in one week earned 56 dollars; each man earned — of \$56, or — dollars.

25. In 56 quarts there are — pecks.

26. 7 times 7 are —.

27. 7 times 8 are —. 8 times 7 are —.

28. Practice Examples 32 and 33 in Lesson 33.

NOTE. — Do not omit the drawings in full.

### XXXV. MULTIPLICATION AND DIVISION

$$7 \times 9, 8 \times 8$$

$a$

1. With  $a$  as the unit of length, draw a rectangle  $7 \times 9$ .  
 2. Divide it into squares, each as long as  $a$ . Call one side  $b$ .

3. Along side  $b$  are — squares in a row.

4. There are — such rows.

5. In all there are — squares.

6. 7 times 9 are —.

7. 9 squares are contained in 63 squares — times.

8.  $\frac{1}{7}$  of 63 squares is — squares.

9. 7 squares are contained in 63 squares — times.

10. 1 yard equals — feet. Think of a square 1 yard long. It is — feet by — feet. It contains — square feet. 1 square yard equals — square feet.

11. 7 square yards equal —— square feet.
  12. 6 square yards equal —— square feet.
  13.  $\frac{1}{3}$  of a square yard equals —— square feet.
  14. 63 square feet equal —— square yards.
  15. A man worked 7 days for \$9 a day. He earned —— dollars.
  16. 63 pounds of sugar were put up in 7-lb. packages. There were —— packages.
  17. With  $a$  as the unit of length, draw a square 8 units long.
    18. Divide it into squares, each as long as  $a$ .
    19. There are —— squares in each row.
    20. There are —— rows.
    21. In all there are —— small squares.
    22. 8 times 8 are ——.
    23.  $\frac{1}{8}$  of 64 squares is —— squares.
    24. 8 chairs at \$8 apiece will cost —— dollars.
    25. 8 books were bought for \$64. Each book cost —— dollars.
    26. \$64 were paid for calves at \$8 each. There were —— calves.
    27. 7 times 9 are ——. 9 times 7 are ——.
    28. 8 times 8 are ——.
    29. Practice examples 32 and 33 in Lesson 33.
- NOTE. — The pupils should in no case fail to draw the figures.



**XXXVI. APPLICATIONS, DIVISION**

1. If 1 barrel of pork costs \$9.78, what will 7 barrels cost?
2. Find the cost of 7 mowing machines at \$21.96 each.
3. Find the cost of 8 carving knives at \$2.89 apiece.
4. Find the weight of 8 car loads of hay, each weighing 8 tons.
5. If 7 car loads of hay weigh 63 tons, each car load must weigh — tons.
6. 5 is contained in 41 — times and — over.
7. 5 is contained in 37 — times and — over.
8. 5 is contained in 48 — times and — over.
9. 6 is contained in 21 — times and — over.
10. 6 is contained in 26 — times and — over.
11. 6 is contained in 32 — times and — over.
12. 6 is contained in 39 — times and — over.
13. 6 is contained in 47 — times and — over.
14. 7 is contained in 27 — times and — over.
15. 7 is contained in 37 — times and — over.
16. 7 is contained in 48 — times and — over.
17. 7 is contained in 65 — times and — over.

*Add:*

**18.**  $16\frac{1}{2}$   
 $28\frac{1}{2}$

19.  $24\frac{1}{4}$   
 $16\frac{1}{2}$

**20.**  $19\frac{1}{2}$   
 $6\frac{1}{3}$

36.  $\frac{4}{4}$

**37. 5**  
**5**

**21.**  $17\frac{1}{2}$   
 $6\frac{1}{5}$

22.  $29\frac{1}{2}$   
 $7\frac{1}{10}$

**23.**  $289\frac{1}{2}$   
 $19\frac{1}{8}$

3  
2

55

**24.**  $108\frac{1}{2}$   
 $4\frac{1}{8}$

**25.**  $16\frac{1}{4}$   
 $7\frac{1}{8}$

26.  $17\frac{1}{5}$   
 $8\frac{1}{10}$

144

555

**27.**  $8\frac{1}{6}$   
 $5\frac{1}{3}$

28.  $7\frac{1}{2}$   
16

29.  $18\frac{1}{4}$   
 $7\frac{1}{8}$

4  
3  
4

5  
5  
5

***Subtract :***

**30.**  $15\frac{1}{2}$   
 $6\frac{1}{4}$

31.  $17\frac{1}{2}$   
 $8\frac{1}{4}$

**32.**  $13\frac{1}{2}$   
 $5\frac{1}{8}$

4  
3  
2

555

**33.**  $14\frac{1}{2}$   
 $9\frac{1}{10}$

**34.**  $18\frac{1}{2}$   
 $5\frac{1}{4}$

**35.**  $23$   
 $8\frac{1}{4}$

1-

555

Try to add each column shown above in 10 seconds. Add down; then up.

**Multiply :**

**38.**  
**843**  
**3**

**39.**  
**379**  
**3**

40.  
269  
3

41.  
271  
3

42.  
395  
3

*Divide:*

**43.**  
**3)2529**

**44.**  
**3)1137**

45.  
3)807

**46.**  
**3)813**

**47.**  
**3) 1185**

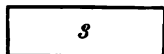
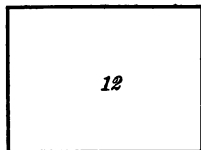
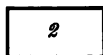
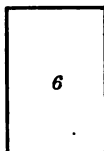
## XXXVII. RATIO

1. The ratio of 6 to 2  
is —.

2. The ratio of 2 to 6  
is —.

3. The ratio of 15 to 6  
is —.

4. The ratio of 5 to 15  
is —.



5. The ratio of 3 to 12 is —.

6. The ratio of 12 to 3 is —.

7. 3 is the ratio of — to 2.

8. 6 is the ratio of 12 to —.

9. The ratio of 6 to 12 is —.

10. If 3 pears cost 7¢, 12 pears will cost — ¢.

11. If 2 apples cost 3¢, 12 apples will cost — ¢.

12. If 6 eggs cost 9¢, 2 eggs will cost — ¢.

13. If 12 pounds of meat cost 96¢, 2 pounds will cost — ¢.

14. If 3 fish weigh 6 pounds, 2 fish of equal size will weigh — pounds. 2 is — — of 3.

15. If 2 acres of land are worth \$60, 3 acres are worth \$—. 3 is — — of 2.

16. 2 is contained in 6 — times.

17. 2 is contained in 12 — times.

18. 2 is contained in 3 ——— times.  
 19. 3 is equal to ——— and ——— twos.  
 20. 2 is equal to ——— of 3.

DRILL

*Multiply:*

- |   |  |  |   |   |   |   |  |  |
|---|--|--|---|---|---|---|--|--|
| 21. $\begin{array}{r} 88 \\ 8 \end{array}$  | $\begin{array}{r} 76 \\ 8 \end{array}$ | $\begin{array}{r} 45 \\ 8 \end{array}$ | 22. $\begin{array}{r} 23 \\ 8 \end{array}$  | $\begin{array}{r} 129 \\ 7 \end{array}$ | $\begin{array}{r} 138 \\ 7 \end{array}$ | 23. $\begin{array}{r} 142 \\ 7 \end{array}$ | $\begin{array}{r} 67 \\ 7 \end{array}$ | $\begin{array}{r} 54 \\ 7 \end{array}$ |
| 24. $\begin{array}{r} 231 \\ 7 \end{array}$ | $\begin{array}{r} 96 \\ 6 \end{array}$ | $\begin{array}{r} 87 \\ 6 \end{array}$ | 25. $\begin{array}{r} 135 \\ 6 \end{array}$ | $\begin{array}{r} 29 \\ 6 \end{array}$  | $\begin{array}{r} 28 \\ 6 \end{array}$  | 26. $\begin{array}{r} 243 \\ 6 \end{array}$ | $\begin{array}{r} 85 \\ 6 \end{array}$ | $\begin{array}{r} 39 \\ 6 \end{array}$ |

*Divide:*

27.  $6 \overline{)216}$     $6 \overline{)474}$     $6 \overline{)402}$    28.  $6 \overline{)564}$     $6 \overline{)516}$     $6 \overline{)264}$   
 29. Practice Examples 36 and 37 in Lesson 36.

XXXVIII. MULTIPLICATION AND DIVISION

$$8 \times 9, 9 \times 9$$

$a$

1. Draw a rectangle  $8 \times 9$ , using  $a$  as the unit of length.
2. Divide it into squares, each as long as  $a$ . Call one long side  $b$ .
3. Along  $b$  is a row of ——— squares.
4. There are ——— such rows.
5. In all there are ——— squares.
6. 8 times 9 are ———.
7. 9 squares are contained in the rectangle ——— times.
8. 9 squares are ——— of 72 squares.

9. 8 squares are contained in the rectangle ——— times.
10. 8 squares are ——— of 72 squares.
11. 8 dozen chairs at \$9 a dozen will cost ——— times ——— dollars, or ——— dollars.
12. 8 square yards are equal to ——— square feet.
13. At 8¢ a pound 72¢ will pay for ——— pounds of cherries. 8¢ are contained in 72¢ ——— times.
14. 8 sheep can be bought for \$72; 1 sheep can be bought for ——— dollars.  $\frac{1}{8}$  of \$72 equals ——— dollars.
15. With  $a$  as the unit of length, draw a square 9 units long.
16. Divide it into squares, each as long as  $a$ .
17. There are ——— squares in each row.
18. There are ——— rows.
19. There are ——— times ——— squares, or ——— squares in all.
20. 9 squares are ——— of the large square.
21. 9 squares are contained in 81 squares ——— times.
22. 9 square yards are equal to ——— square feet. (Lesson 35, Example 10.)
23. To pay 9 men \$9 each will require \$ ———.
24. If the railroad fare between two places is \$9, \$81 will pay the fare of ——— persons. \$9 are contained in \$81 ——— times.
25. 9 tables cost \$81; each table must have cost ——— dollars.  $\frac{1}{9}$  of \$81 equals ——— dollars.

26. 8 times 9 are ——. 9 times 8 are ——.   
27. 9 times 9 are ——.   
28. Practice Examples 36 and 37 in Lesson 36.

NOTE.—The pupils should make all drawings required.

### XXXIX. APPLICATIONS

1. There are 6 work days in a week. In 6 weeks there are — work days. 6 times 6 are —.
2. There are 6 horses in each of 7 fields. In all there are — horses. 7 times 6 are —.
3. 6 poles, each 8 feet long, laid end to end, will reach — feet. 6 times 8 are —.
4. 6 quarts of currants at 9¢ a quart will cost — ¢. 6 times 9 are —.
5. 7 rules, each 6 inches long, if placed end to end, will reach — inches. 7 times 6 are —.
6. 7 papers of pins at 7¢ each will cost — cents. 7 times 7 are —.
7. 7 quarts of berries at 8¢ each will cost — cents. 7 times 8 are —.
8. 7 pounds of meat at 9¢ a pound will cost — cents. 7 times 9 are —.
9. 6 feet are 1 fathom. How many feet in 8 fathoms? 8 times 6 are —.
10. How many days in 8 weeks? 8 times 7 are —.
11. In 8 pecks there are — quarts. 8 times 8 are —.

12. A man traveling 9 miles an hour for 8 hours will travel — miles. 8 times 9 are —.

13. 9 bushels of seed corn at \$9 a bushel will cost — dollars. 9 times 9 are —.

14. 6 times 10 are —. 17. 9 times 10 are —.

15. 7 times 10 are —. 18. 10 times 10 are —.

16. 8 times 10 are —.

### DRILL

*Multiply :*

$$\begin{array}{r} 19. \quad 23 \quad 24 \quad 35 \\ \quad \quad 6 \quad 6 \quad 6 \\ \hline \end{array}$$

$$\begin{array}{r} 20. \quad 46 \quad 57 \quad 68 \\ \quad \quad 6 \quad 6 \quad 6 \\ \hline \end{array}$$

$$\begin{array}{r} 21. \quad 79 \quad 87 \quad 69 \\ \quad \quad 6 \quad 6 \quad 6 \\ \hline \end{array}$$

$$\begin{array}{r} 22. \quad 21 \quad 32 \quad 43 \\ \quad \quad 7 \quad 7 \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 23. \quad 54 \quad 65 \quad 76 \\ \quad \quad 7 \quad 7 \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 24. \quad 87 \quad 98 \quad 69 \\ \quad \quad 7 \quad 7 \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 25. \quad 23 \quad 32 \quad 43 \\ \quad \quad 8 \quad 8 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 26. \quad 54 \quad 65 \quad 76 \\ \quad \quad 8 \quad 8 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 27. \quad 87 \quad 98 \quad 69 \\ \quad \quad 8 \quad 8 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 28. \quad 23 \quad 32 \quad 43 \\ \quad \quad 9 \quad 9 \quad 9 \\ \hline \end{array}$$

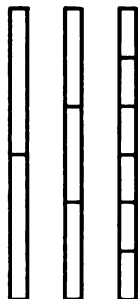
$$\begin{array}{r} 29. \quad 54 \quad 65 \quad 76 \\ \quad \quad 9 \quad 9 \quad 9 \\ \hline \end{array}$$

$$\begin{array}{r} 30. \quad 87 \quad 98 \quad 69 \\ \quad \quad 9 \quad 9 \quad 9 \\ \hline \end{array}$$

31. Practice Examples 36 and 37 in Lesson 36.

## XL. SIXTHS

1. One whole is ——— sixths.
2. One half equals ——— sixths.
3. One third equals ——— sixths.
4. One half and one third equal ——— sixths.
5. One half less one third equals ——— sixth.
6. One half less one sixth equals ———  
sixths.



7. One third less one sixth equals ——— sixth.
8. Two times one third equal ——— thirds.
9. Two times one half equal ——— halves.
10. Four times one sixth equal ——— sixths.
11. Three times two sixths equal ——— sixths.
12. One sixth is contained in one half ——— times.
13. One sixth is contained in one third ——— times.
14. One sixth is contained in two thirds ——— times.
15. Two sixths are contained in one whole ——— times.
16. One half of one third equals ——— ———.
17. One third of one half equals ——— ———.

## DRILL

*Add :*

$$\begin{array}{r} 18. \quad 3\frac{1}{2} \quad 4\frac{2}{6} \\ \quad \quad 5\frac{1}{3} \quad 6\frac{1}{2} \end{array}$$

$$\begin{array}{r} 19. \quad 7\frac{1}{6} \quad 6\frac{1}{3} \\ \quad \quad 2\frac{1}{2} \quad 5\frac{1}{6} \end{array}$$

$$\begin{array}{r} 20. \quad 21\frac{3}{6} \\ \quad \quad 8\frac{2}{6} \end{array}$$

$$\begin{array}{r} 21. \quad 4\frac{2}{6} \\ \quad \quad 2\frac{1}{2} \end{array}$$



*Subtract :*

$$\begin{array}{r} 22. \quad 9\frac{1}{2} \quad 8\frac{1}{2} \\ \quad \quad 3\frac{1}{3} \quad 4\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 24. \quad 10\frac{1}{2} \quad 15\frac{1}{3} \\ \quad \quad 5\frac{1}{6} \quad 5\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 23. \quad 7\frac{1}{3} \quad 8\frac{1}{2} \\ \quad \quad 2\frac{1}{6} \quad 4\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 25. \quad 12\frac{1}{3} \quad 7\frac{1}{2} \\ \quad \quad 8\frac{1}{4} \quad 3\frac{1}{5} \\ \hline \end{array}$$

*Multiply :*

$$\begin{array}{r} 26. \quad 47 \quad 68 \\ \quad \quad 6 \quad 6 \\ \hline \end{array}$$

$$\begin{array}{r} 28. \quad 54 \quad 98 \\ \quad \quad 7 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 30. \quad 86 \quad 45 \\ \quad \quad 9 \quad 9 \\ \hline \end{array}$$

$$\begin{array}{r} 27. \quad 79 \quad 68 \\ \quad \quad 6 \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 29. \quad 67 \quad 54 \\ \quad \quad 8 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 31. \quad 56 \quad 55 \\ \quad \quad 8 \quad 8 \\ \hline \end{array}$$

**32.**

4

3

2

1

5

4

3

2

1

3

3

3

4

4

4

Add down ; then up. Try to do it in 10 seconds.

**XLI. EIGHTHS**

1. One whole equals  
— eighths.



2. One half equals —  
eighths.



3. One fourth equals (Pupils should draw these.)  
— eighths.

4. One half and one fourth equal — eighths.

5. One half and one eighth equal — eighths.

6. One fourth and one eighth equal — eighths.

7. One half and two eighths equal — eighths.

8. One half and three eighths equal — eighths.
9. One half and four eighths equal — eighths.
10. One fourth and two eighths equal — eighths.
11. One half less one fourth equals — fourths.
12. One half less one eighth equals — eighths.
13. One fourth less one eighth equals — eighths.
14. Three fourths less one eighth equals — eighths.
15. Three fourths less three eighths equal — eighths.
16. Two times one eighth equal — eighths.
17. Two times two eighths equal — eighths.
18. Two times three eighths equal — eighths.
19. One eighth is contained in one half — times.
20. One eighth is contained in one fourth — times.
21. Two eighths are contained in three fourths — times.
22. One fourth is contained in one half — times.

## DRILL

*Add:*

$$\begin{array}{r} 23. \quad 2\frac{1}{2} \\ \quad 3\frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 5\frac{1}{4} \\ \quad 6\frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 24. \quad 7\frac{1}{8} \\ \quad 4\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 9\frac{3}{8} \\ \quad 2\frac{1}{4} \\ \hline \end{array}$$

*Subtract:*

$$\begin{array}{r} 25. \quad 9\frac{1}{2} \\ \quad 2\frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{1}{4} \\ \quad 3\frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 26. \quad 8\frac{5}{8} \\ \quad 2\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 12\frac{7}{8} \\ \quad 3\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 27. \quad 8\frac{7}{8} \\ \quad 3\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 16\frac{3}{8} \\ \quad 4\frac{1}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 28. \quad 11\frac{2}{3} \\ \quad 6\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 12\frac{2}{3} \\ \quad 3\frac{1}{2} \\ \hline \end{array}$$

**XLII. REDUCTION OF FRACTIONS**

1. One whole equals — halves.
2. Two wholes equal — halves.
3. Three wholes equal — halves.
4. One whole equals — fourths.
5. Two wholes equal — fourths.
6. Three wholes equal — fourths.
7. One whole equals — sixths.
8. Two wholes equal — sixths.
9. Three wholes equal — sixths.
10. One whole equals — eighths.
11. Two wholes equal — eighths.
12. Three wholes equal — eighths.
13. Two halves equal — whole or one.
14. Three halves equal  $1\frac{1}{2}$ .
15. Four halves equal —.
16. Five halves equal —.
17. Six halves equal —.
18. Four fourths equal —.
19. Five fourths equal —.
20. Six fourths equal — ( $1\frac{2}{4}$ ).
21. Seven fourths equal —.
22. Eight fourths equal —.
23. Nine fourths equal —.
24. Ten fourths equal —.
25. Eleven fourths equal —.
26. Twelve fourths equal —.
27. Six sixths equal —.
28. Seven sixths equal —.
29. Eight sixths equal —.
30. Nine sixths equal —.
31. Ten sixths equal —.

32. Eleven sixths equal ——. 41. 9 eighths equal ——. 42. 10 eighths equal ——. 43. 11 eighths equal ——. 44. 12 eighths equal ——. 45. 13 eighths equal ——. 46. 14 eighths equal ——. 47. 15 eighths equal ——. 48. 16 eighths equal ——. 49. Practice Example 32 in Lesson 40.
50. 5 equals — halves. 51. 7 equals — halves. 52. 4 equals — halves. 53. 8 equals — halves. 54. 4 equals — fourths. 55. 5 equals — fourths. 56. 6 equals — fourths. 57. 10 equals — fourths. 58. 8 equals — sixths. 59. 9 equals — sixths. 60. 7 equals — sixths. 61. 4 equals — eighths.
62. 5 equals — eighths. 63. 7 halves equal ——. 64. 8 halves equal ——. 65. 10 halves equal ——. 66. 14 fourths equal ——. 67. 15 fourths equal ——. 68. 21 sixths equal ——. 69. 25 sixths equal ——. 70. 31 sixths equal ——. 71. 17 eighths equal ——. 72. 18 eighths equal ——. 73. 19 eighths equal ——.

NOTE. — Reduction is changing the form without changing the value.

## XLIII. APPLICATIONS

1. If a person can walk half a mile in 8 minutes, he can walk  $\frac{1}{4}$  of a mile in — minutes.

2. If  $\frac{1}{3}$  of a barrel of potatoes is worth \$.50,  $\frac{1}{6}$  of a barrel is worth — cents.

3. If  $\frac{1}{2}$  of a bushel of wheat is worth \$.60,  $\frac{1}{6}$  of a bushel is worth — cents.

4. By walking  $\frac{1}{2}$  of a mile in 8 minutes, a man can walk  $1\frac{1}{2}$  miles in — minutes.

5. If  $\frac{1}{3}$  of a barrel of potatoes is worth \$.50,  $1\frac{1}{3}$  barrels are worth — cents.

6. If  $\frac{1}{6}$  of a bushel of grain is worth \$.14,  $1\frac{1}{6}$  bushels are worth — cents.

7. If  $\frac{1}{4}$  of a bushel of wheat weighs 15 pounds,  $1\frac{1}{4}$  bushels weigh — pounds.

8. If plums cost 40¢ a peck, a quart will cost — cents.

9. Find the cost of 7 quarts of plums, if a peck cost 40 cents.

10. When a gallon of milk costs 32 cents, 3 qt. will cost — ¢.

11. When 3 gallons of milk cost 84 cents, what will  $\frac{1}{2}$  gallon cost?

12. In 3 feet there are — inches. In  $\frac{1}{3}$  of a foot there are — inches.

13. When  $\frac{7}{8}$  of a yard of cloth cost 14 cents,  $\frac{1}{8}$  of a yard will cost — ¢, and a yard will cost — times — ¢, or — cents.

14.  $\frac{1}{2}$  and  $\frac{1}{4}$  equal — fourths.

15.  $\frac{1}{2}$  and  $\frac{1}{3}$  equal — sixths.

16.  $\frac{1}{2}$  and  $\frac{1}{6}$  equal — sixths.

17.  $\frac{1}{3}$  and  $\frac{1}{6}$  equal — sixths.

18.  $\frac{1}{2}$  and  $\frac{1}{8}$  equal — eighths.

19.  $\frac{1}{4}$  and  $\frac{1}{8}$  equal — eighths.

20.  $\frac{1}{2}$  less  $\frac{1}{4}$  equal — fourths.

21.  $\frac{1}{2}$  less  $\frac{1}{3}$  equal — sixths.

22.  $\frac{1}{2}$  less  $\frac{1}{6}$  equal — sixths.

23.  $\frac{1}{2}$  less  $\frac{1}{8}$  equal — eighths.

24.  $\frac{1}{4}$  less  $\frac{1}{8}$  equal — eighths.

25.  $\frac{1}{3}$  less  $\frac{1}{6}$  equal — sixths.

## DRILL

*Add :*

26.	$2\frac{1}{2}$	$6\frac{1}{3}$	27.	$4\frac{1}{8}$	$8\frac{1}{3}$
	$3\frac{1}{4}$	$7\frac{1}{6}$		$7\frac{1}{2}$	$7\frac{1}{2}$
	<hr/>	<hr/>		<hr/>	<hr/>

*Subtract :*

28.	$18\frac{1}{2}$	$24\frac{1}{2}$	29.	$9\frac{1}{2}$	$15\frac{1}{2}$
	$5\frac{1}{3}$	$14\frac{1}{4}$		$2\frac{1}{6}$	$7\frac{1}{8}$
	<hr/>	<hr/>		<hr/>	<hr/>

*Multiply :*

30.	$23\frac{1}{2}$	$16\frac{1}{6}$	31.	$27\frac{1}{8}$	$15\frac{1}{4}$
	2	3		4	3
	<hr/>	<hr/>		<hr/>	<hr/>

*Divide :*

32.  $3 \overline{)198}$

$4 \overline{)176}$

33.  $5 \overline{)165}$

$6 \overline{)198}$

34. Practice Example 32 in Lesson 40.

#### XLIV. MULTIPLICATION AND DIVISION

$$4 \times 11, 4 \times 12$$

$a$

1. Using  $a$  as the unit of length, draw a rectangle 4 by 11.

2. Divide it into squares, each as long as  $a$ . Call one side  $b$ .

3. Along  $b$  is a row of — squares.

4. There are — such rows.

5. In all there are — squares.

6. 4 times 11 are —.

7. 11 squares are contained in the rectangle — times.

8. 4 rows are contained in the rectangle — times.

9. 11 is contained in 44 — times.

10. 4 is contained in 44 — times.

11.  $\frac{1}{4}$  of 44 is —.

12.  $\frac{1}{11}$  of 44 is —.

13. 4 rows of trees containing 11 trees in a row contain — trees in all.

14. \$44 were divided equally among 4 men. Each man received \$—.

15. 4 pancakes were given to each person at the table ; 44 pancakes in all were eaten. How many persons were at the table ?

16. With  $a$  as the unit of length, make a rectangle  $4 \times 12$ .

17. Divide it into squares each as long as  $a$ . Call one side  $b$ .

18. Along  $b$  is a row of — squares.

19. There are — such rows.

20. In all there are — squares.

21. 4 times 12 are —.

22. 4 squares are contained in the rectangle — times.

23. 12 squares are contained in the rectangle — times.

24. 4 is — — of 48. 12 is — — of 48.

25. 4 desks at \$12 apiece will cost \$—.

26. For \$48, a team at \$4 per day can be hired for — days.

27. 12 books can be bought for \$48. They average \$— apiece.

28. 4 times 11 are —. 11 times 4 are —.

29. 4 times 12 are —. 12 times 4 are —.

30. Practice Examples 29 and 30 in Lesson 19.

NOTE. — Require the drawings.



## XLV. MULTIPLICATION AND DIVISION

$$5 \times 11, 5 \times 12$$

$a$

1. With  $a$  as the unit of length, draw a rectangle  $5 \times 11$ .

2. Divide it into squares, each as long as  $a$ . Call one side  $b$ .

3. Along  $b$  is a row of — squares.

4. There are — such rows.

5. In all there are — squares.

6. 5 times 11 are —.

7. 11 squares are contained in the rectangle — times.

8. 5 squares are contained in the rectangle — times.

9. 11 is — of 55.

10. 5 boys holding 11 pencils apiece hold all together — pencils.

11. 5 girls had 55 apples equally divided among them. Each girl had — apples.

12. 55¢ will pay for — rides on the street car. (Fare, 5¢.)

13.  $\frac{2}{11}$  of 55 is —.

14. With  $a$  as the unit of length, draw a rectangle  $5 \times 12$ .

15. Divide it into squares each as long as  $a$ .

16. Considering the rectangle lengthwise, there are — squares in a row.

17. There are — such rows.

18. In all there are — squares.
19. 5 times 12 are —.
20. 12 squares are contained in the rectangle — times.
21. 5 squares are contained in the rectangle — times.
22. 12 is contained in 60 — times.
23. 5 is contained in 60 — times.
24. 5 horse rakes at \$12 apiece cost \$—.
25. At 5¢ apiece, for 60¢ I can buy — pencils.
26.  $\frac{1}{5}$  of 60 is —.  $\frac{2}{5}$  of 60 are —.
27. 5 times 11 are —. 11 times 5 are —.
28. 5 times 12 are —. 12 times 5 are —.
29. Practice Examples 27 and 28 in Lesson 24.

NOTE. — Require the drawings.

## XLVI. MULTIPLICATION AND DIVISION

$$6 \times 11, 6 \times 12$$

$a$

1. With  $a$  as the unit of length, draw a rectangle  $6 \times 11$ .
2. Divide it into squares, each as long as  $a$ .
3. Considering the rectangle lengthwise, each row has — squares.
4. There are — such rows.
5. In all there are — squares.
6. 6 times 11 are —.
7. 11 squares are contained in the rectangle — times.

8. 6 squares are contained in the rectangle — times.
9.  $\frac{1}{6}$  of — is 11.
10.  $\frac{1}{11}$  of — is 6.
11. In 1 fathom are 6 ft. In 11 fathoms are — feet.
12. At 6¢ a pound, 66¢ will buy — pounds of sugar.
13. 11 children received 66 cents. Each child received — ¢.
14. In 66 feet there are — fathoms.
15. With  $a$  as the unit of length, draw a rectangle  $6 \times 12$ .
16. Divide it into squares each as long as  $a$ .
17. Considering the rectangle lengthwise, each row has — squares.
18. There are — rows.
19. In all there are — squares.
20. 6 times 12 are —.
21. 12 squares are contained in the rectangle — times.
22. 6 squares are contained in the rectangle — times.
23.  $\frac{1}{6}$  of — is 12.
24.  $\frac{1}{12}$  of — is 6.
25. 6 dozen are —.
26. 6 years equal — months.
27. In 72 months there are — years.

28. A man who sells 72 eggs sells ——— dozen eggs.
29. In 6 feet there are ——— inches.
30. In 72 inches there are ——— feet.
31. 6 times 11 are ———. 11 times 6 are ———.
32. 6 times 12 are ———. 12 times 6 are ———.
33. Practice Examples 25 and 26 in Lesson 29.

NOTE.—Require the drawings.

## XLVII. MULTIPLICATION AND DIVISION

$$7 \times 17, 7 \times 12$$

$a$

1. With  $a$  as the unit of length, draw a rectangle  $7 \times 11$ .
2. Divide it into squares, each as long as  $a$ .
3. In each of the long rows there are ——— squares.
4. There are ——— such rows.
5. In all there are ——— squares.
6. 7 times 11 are ———.
7. 11 squares are contained in the rectangle ——— times.
8. 7 squares are contained in the rectangle ——— times.
9.  $\frac{1}{7}$  of ——— is 11.
10.  $\frac{1}{11}$  of ——— is 7.
11. In 11 7-pound packages of sugar there are ——— pounds.
12. At 7¢ a pound, 77¢ will buy ——— pounds of rice.

13. If 7 articles cost \$77, each article cost on an average — dollars.
14. With  $a$  as the unit of length, draw a rectangle  $7 \times 12$ .
15. Divide it into squares, each as long as  $a$ .
16. In each of the long rows there are — squares.
17. There are — such rows.
18. 7 times 12 are —.
19. 12 squares are contained in the rectangle — times.
20. 7 squares are contained in the rectangle — times.
21. 12 is — — of 84. 12 is contained in 84 — times.
22. 7 is — — of 84. 7 is contained in 84 — times.
23. 12 tons of coal at \$7 a ton will cost — dollars.
24. \$84 will buy at \$7 a pair — pairs of boots.
25. 7 dozen oranges are — oranges.
26. 7 years are — months.
27. In 84 lemons are — dozen lemons.
28. In 7 ft. there are — inches.
29. 7 times 11 are —. 11 times 7 are —.
30. 7 times 12 are —. 12 times 7 are —.
31. Practice Examples 32 and 33 in Lesson 33.

NOTE. — Require the drawings.

**XLVIII. MULTIPLICATION AND DIVISION**

$$8 \times 11, 8 \times 12$$

 $a$ 

1. With  $a$  as the unit of length, draw a rectangle  $8 \times 11$ .

2. Divide it into squares, each as long as  $a$ .

3. The long rows have — squares in each.

4. There are — long rows.

5. In all there are — squares.

6. 8 times 11 are —.

7. 11 squares are contained in the rectangle — times.

8. 8 squares are contained in the rectangle — times.

9. 11 is  $\frac{1}{8}$  of —.

10. 8 is  $\frac{1}{11}$  of —.

11. 11 lamps at \$8 each will cost — dollars.

12. At 8¢ a pound, 88¢ will pay for — pounds of sugar.

13. If 88 pounds of hay are fed to 8 cows, each cow should receive — lb.

14. With  $a$  as the unit of length, draw a rectangle  $8 \times 12$ .

15. Divide it into squares, each as long as  $a$ .

16. Each of the long rows has — squares.

17. There are — long rows.

18. In all there are — squares.

19. 8 times 12 are —.

20. 12 squares are contained in the rectangle — times.
21. 8 squares are contained in the rectangle — times.
22. 12 is contained in 96 — times.
23. 8 is contained in 96 — times.
24. In 8 years there are — months.
25. In 96 eggs there are — dozen eggs.
26. In 8 ft. there are — inches.
27. In 96 months there are — years.
28. 8 times 11 are —. 11 times 8 are —.
29. 8 times 12 are —. 12 times 8 are —.
30. Practice Examples 36 and 37 in Lesson 36.

NOTE. — Require the drawings.

### XLIX. MULTIPLICATION AND DIVISION

$$9 \times 11, 9 \times 12$$

$a$

1. With  $a$  as the unit of length, draw a rectangle  $9 \times 11$ .
2. Divide it into squares, each as long as  $a$ .
3. In each of the long rows there are — squares.
4. There are — long rows.
5. In all there are — squares.
6. 9 times 11 are —.
7. 11 squares are contained in the rectangle — times.
8. 9 squares are contained in the rectangle — times.
9. 11 squares are — — of 99 squares.

10. 9 squares are ——— of 99 squares.
11. 11 is contained in 99 ——— times.
12. 9 is contained in 99 ——— times.
13. 9 sheep at 11 dollars apiece will cost ——— times \$ ———, or ——— dollars.
14. If \$99 will pay for 11 watches, each watch will cost ——— of \$ ———, or \$ ———.
15. With  $a$  as the unit of length, draw a rectangle  $9 \times 12$ .
16. Divide the rectangle into squares, each as long as  $a$ .
17. In each of the long rows there are ——— squares.
18. There are ——— long rows.
19. In all there are ——— squares.
20. 9 times 12 are ———.
21. 12 squares are contained in the rectangle ——— times.
22. 9 squares are contained in the rectangle ——— times.
23. 12 is contained in 108 ——— times.
24. 9 is contained in 108 ——— times.
25. 9 years equal ——— months.
26. In 108 inches there are ——— feet.
27. In 9 dozen bananas there are ——— bananas.
28. 9 times 11 are ———. 11 times 9 are ———.
29. 9 times 12 are ———. 12 times 9 are ———.
30. Practice Example 32 in Lesson 40.

NOTE. — Require the drawings.



**L. APPLICATIONS. DRILL**

1. In 4 rows of books, containing 11 books each, there are — books.

2. There were 12 cows in each of 4 fields. In all 4 fields there were — cows.

3. A train running 11 miles an hour for 5 hours will go — miles.

4. A man earning \$12 a day for 5 days will earn — dollars.

5. In 6 rows of corn containing 11 hills each there are — hills.

6. 6 packages of meal at 12¢ each will cost — cents.

7. 7 bins containing 11 bushels each will hold — bushels.

8. 7 window panes at 12¢ apiece will cost — cents.

9. In 96 pecks of grain there are — bushels.

10. In 11 square yards there are — square feet.

11. At \$12 apiece for \$108 I can buy — sheep.

12. I have 44 books in 4 rows, all rows containing the same number. There are — books in each row.

13. A farmer kept 48 horses, the same number in each of four stables. In each stable there were — horses.

14. 60 pounds of salt were put into five equal parcels. There were — pounds in each.

15. \$66 were divided equally among 6 persons. Each received \$—.

Multiplication drill can be quite well secured by this device placed upon the blackboard. The multiplier at the center may be replaced by the numbers 3, 4, 5, 6, 7, 8, 9.

Point to the outer numbers and require results rapidly.

1	2	3	4
12	8		5
11			6
10	9	8	7

## LI. RATIO

1. The ratio of 8 to 24 is \_\_\_\_.

The ratio of 24 to 8 is \_\_\_\_.

2. The ratio of 8 to 48 is \_\_\_\_.

The ratio of 48 to 8 is \_\_\_\_.

3. The ratio of 8 to 64 is \_\_\_\_.

The ratio of 64 to 8 is \_\_\_\_.

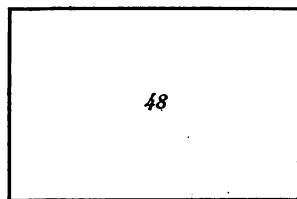
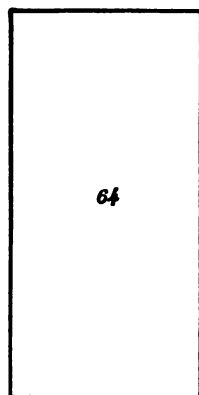
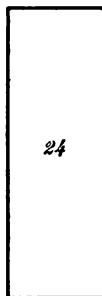
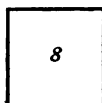
4. The ratio of 24 to 48 is \_\_\_\_.

The ratio of 48 to 24 is \_\_\_\_.

5. The ratio of 24 to 64 is \_\_\_\_.

The ratio of 64 to 24 is \_\_\_\_.

6. The ratio of 48 to 64 is \_\_\_\_.



7. If 8 cows cost \$88, 24 cows will cost \$——. (Ratio of 24 to 8.)

8. If 8 lb. of rice cost 72¢, 48 lb. will cost ——¢.

9. If 8 trees cost \$16, 64 trees will cost \$——.

10. If 24 lb. of sugar cost \$1.20, 48 lb. will cost \$——.

11. If 48 erasers are worth \$12, 8 erasers are worth \$——, and 64 erasers are worth \$——.

17. Add in 10 seconds: first down, then up.

12. If 64 knives cost \$32, 8 knives will cost \$——.

13. If 64 knives cost \$32, 24 knives will cost \$——. (Ratio of 24 to 8.)

14. If 64 knives cost \$32, 8 knives will cost \$——, and 48 knives will cost \$——.

15. How many 8's in 16, 32, 24, 40, 64, 45, 56, 80, 72, 96, 88?

16. How many 7's in 21, 35, 28, 7, 42, 14, 56, 49, 70, 84, 63, 77?

(Place these numbers on the blackboard for a drill in division.)

4  
5  
4  
5  
4  
5  
4  
5  
4  
3  
1  
3  
3  
—

NOTE. — It may be necessary to read this lesson several times in order to thoroughly master it. More real progress will be made by doing this than by advancing too rapidly. If pupils become tired, defer further reading to a subsequent period.

## LII. MULTIPLICATION AND DIVISION

$$10 \times 11, 10 \times 12$$

$a$

1. With  $a$  as the unit of length, draw a rectangle 10 by 11.

2. Divide it into squares, each as long as  $a$ . Call the long side  $b$ .

3. Along  $b$  is a row of — squares.

4. There are — such rows.

5. In all there are — squares.

6. 10 times 11 are —.

7. 11 squares are contained in the rectangle — times.

8. 10 squares are contained in the rectangle — times.

9. 11 squares are — — of 110 squares.

10. 10 squares are — — of 110 squares.

11. 11 dimes are — cents.

12. 11 quarts of berries at 10 cents a quart will cost — cents.

13. At 10 cents a pound 110 cents will buy — pounds of cherries.

14. With  $a$  as the unit of length, draw a rectangle 10 by 12.

15. Divide it into squares, each as long as  $a$ .

16. Each of the long rows has — squares.

17. There are — long rows.

18. In all there are — squares.

19. 10 times 12 are —.
20. 12 squares are contained in the rectangle — times.
21. 10 squares are contained in the rectangle — times.
22. 12 is contained in 120 — times.
23. 10 is contained in 120 — times.
24. In 10 years there are — months.
25. In 120 there are — dozen.
26. In 10 feet there are — inches.
27. 10 times 11 are —.
28. 11 times 10 are —.
29. 10 times 12 are —. 12 times 10 are —.
30. Practice Example 17 in Lesson 51.

### LIII. MULTIPLICATION AND DIVISION

$$11 \times 11, 11 \times 12$$

$a$

1. With  $a$  as the unit of length, draw a square 11 units long.
2. Divide it into squares, each as long as  $a$ .
3. Along one side is a row of — squares.
4. There are — such rows.
5. In all there are — squares.
6. 11 times 11 are —.
7. 11 squares are contained in the large square — times.
8. 11 is contained in 121 — times.

9.  $\frac{1}{11}$  of 121 is —.
10. 11 buffalo robes at \$11 each will cost \$—.
11. For \$121 there can be bought as many sheep at \$11 each as \$— are contained times in \$—, or — sheep.
12. With  $a$  as the unit of length, draw a rectangle 11 by 12.
13. Divide it into squares, each as long as  $a$ . Call one of the long sides  $b$ .
14. Along the side  $b$  is a row of — squares.
15. There are — such rows.
16. In all there are — squares.
17. 11 times 12 are —.
18. 12 squares are contained in the rectangle — times.
19. 11 squares are contained in the rectangle — times.
20. 12 squares are — — of 132 squares.
21. 11 squares are — — of 132 squares.
22. A man buys 11 quarts of berries at 12¢. They cost him — cents.
23. A woman bought 11 pounds of fruit for 132¢. She paid —¢ a pound.
24. 11 times 11 are —. 11 times 12 are —. 12 times 11 are —.
25. Practice Example 17 in Lesson 51.

## LIV. MULTIPLICATION AND DIVISION

$$12 \times 12$$

 $a$ 

1. With  $a$  as the unit of length, draw a square 12 units long.
2. Divide it into squares, each as long as  $a$ .
3. Along one side of the square is a row of — squares.
4. There are — such rows.
5. In all there are — squares.
6. 12 times 12 are —.
7. 12 squares are contained in the large square — times.
8. 12 is contained in 144 — times.
9.  $\frac{1}{12}$  of 144 is —.
10. 12 stoves at \$12 each will cost \$—.
11. If 12 boxes of equal weight weigh 144 lb., each box must weigh — — of 144 lb., or — lb.
12. 12 dozen pens are — pens.
13. 144 inches are — feet.
14. The ratio of 16 to 2 is —.
15. The ratio of 2 to 16 is — —.
16. If 2 bushels of apples are worth 80¢, 16 bushels are worth \$—.
17. If 16 pounds of meat cost \$1.44, 2 pounds will cost — ¢.

18. If 9 pounds of tea cost \$12, 45 pounds will cost \$——.

19. If 45 pounds of coffee cost \$20, 9 pounds will cost \$——.

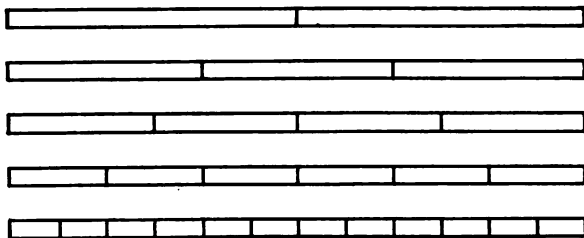
*Multiply:*

20.	21	32	45	23.	45	67	98	26.	98	21	32
	<u>4</u>	<u>4</u>	<u>4</u>		<u>6</u>	<u>6</u>	<u>6</u>		<u>8</u>	<u>9</u>	<u>9</u>

21.	98	21	32	24.	32	45	67	27.	67	98	21
	<u>4</u>	<u>5</u>	<u>5</u>		<u>7</u>	<u>7</u>	<u>7</u>		<u>9</u>	<u>9</u>	<u>3</u>

22.	67	98	21	25.	21	32	45	28.	45	67	98
	<u>5</u>	<u>5</u>	<u>6</u>		<u>8</u>	<u>8</u>	<u>8</u>		<u>3</u>	<u>3</u>	<u>3</u>

LV. TWELFTHS



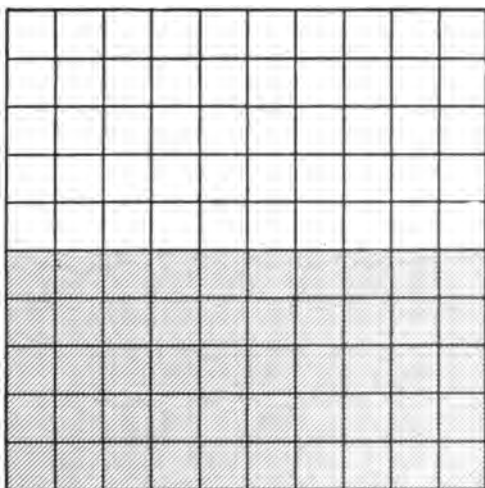
(Pupils should draw these lines.)

1. One whole = —— twelfths.
2. One whole = —— sixths.
3. One whole = —— fourths.
4. One whole = —— thirds.
5. One whole = —— halves.



6. One half = — twelfths.
7. One third = — twelfths.
8. One fourth = — twelfths.
9. One sixth = — twelfths.
10. One half and one twelfth are — twelfths.
11. One third and one twelfth are — twelfths.
12. One fourth and one twelfth are — twelfths.
13. One sixth and one twelfth are — twelfths.
14. One half less one twelfth is — twelfths.
15. One third less one twelfth is — twelfths.
16. One fourth less one twelfth is — twelfths.
17. One sixth less one twelfth is — twelfth.
18. One half and one third and one fourth are — twelfths.
19. One fourth and one sixth are — twelfths.
20. One third and one fourth are — twelfths.
21. One third less one fourth is — twelfth.
22. One twelfth multiplied by 2 is — twelfths.
23. One half is contained in one whole — times.
24. One third is contained in one whole — times.
25. One twelfth is contained in one sixth — times.
26. One twelfth is contained in one fourth — times.
27. One twelfth is contained in one third — times.
28. One twelfth is contained in one half — times.

**LVI. 25 %, 50 %**



1. This square is divided into — small squares.
2. Each small square is — — of the large square.
3. In one half of the large square there are — small squares.
4. One half equals — hundredths.
5. Per cent means “by the hundred.” 50 hundredths may be called 50 per cent. (Written 50%.) 50% equals — —.
6. Each small square is — — of the large square, or — % of it.
7. 25 small squares are — hundredths of the large square, or — % of it.
8. 25 small squares are contained in the large square — times. 25% of anything is — — of it.

9. 50% of 8 equals ——— of 8, or ———.
10. 25% of 8 equals ——— of 8, or ———.
11. 50% of 10 equals ——— of 10, or ———.
12. 25% of 16 equals ——— of 16, or ———.
13. The sum of 50% of 24 and 25% of 20 is ———.
14. The difference of 25% of 28 and 50% of 12 is ———.
15. Find 50% of 14, 18, 26, 21, 23, 19, 30, 32, 34.
16. Find 25% of 12, 24, 28, 17, 21, 29, 32, 36, 40.  
(25% of 37 is  $\frac{1}{4}$  of 37.  $\frac{1}{4}$  of 36 is 9.  $\frac{1}{4}$  of one is  $\frac{1}{4}$ .  
 $9\frac{1}{4}$  Ans.)

17. What is the next number below 11 that 3 will exactly divide? Below 17? 20? 26? 29? 14?

18. What is the next number below 14 that 4 will exactly divide? Below 18? 23? 30? 38? 41? 27? 33?

19. What is the next number below 18 that 5 will exactly divide? Below 32? 24? 42? 27? 47? 38? 53?

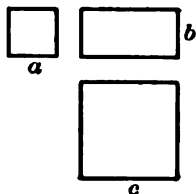
#### DRILL

*Divide :*

- |                         |                         |                         |                         |
|-------------------------|-------------------------|-------------------------|-------------------------|
| 20. $4 \overline{)128}$ | 25. $4 \overline{)260}$ | 30. $5 \overline{)115}$ | 35. $5 \overline{)420}$ |
| 21. $4 \overline{)96}$  | 26. $4 \overline{)292}$ | 31. $5 \overline{)185}$ | 36. $5 \overline{)475}$ |
| 22. $4 \overline{)136}$ | 27. $4 \overline{)352}$ | 32. $5 \overline{)230}$ | 37. $5 \overline{)695}$ |
| 23. $4 \overline{)156}$ | 28. $4 \overline{)396}$ | 33. $5 \overline{)275}$ | 38. $5 \overline{)490}$ |
| 24. $4 \overline{)180}$ | 29. $4 \overline{)374}$ | 34. $5 \overline{)355}$ | 39. $5 \overline{)620}$ |

## LVII. MAGNITUDES

1. The ratio of  $a$  to  $b$  is — — —.
2. The ratio of  $a$  to  $c$  is — — —.
3.  $a$  equals — — — of  $c$ , or — — — % of  $c$ .
4.  $b$  equals — — — of  $c$ , or — — — % of  $c$ .
5.  $a$  equals — — — of  $b$ , or — — — % of  $b$ .
6. The ratio of 25% of a number to 50% of the number is — — —.
7. The ratio of 50% of a number to 25% of the number is — — —.
8. If 25% of a certain number is 13, 50% of the same number is — — —.
9. If 25% of a certain number is 7, 100% of the same number is — — —.
10. If 50% of a certain number is 12, 25% of the same number is — — —.
11. If 50% of a certain number is 14, 100% of the same number is — — —.
12. One whole equals — — — halves, or — — — thirds, or — — — fourths, or — — — hundredths, or — — — %.
13. If 30 is 50% of a number, 100% of the number must be — — —.
14. If 17 lb. is 25% of my weight, I must weigh — — — lb.



15. If \$4 is 50% of my money, I must have \$——.

16. My father is 40 years of age. My age equals 50% of his. I am —— years old.

17. My brother weighs 120 pounds, and I weigh 50% as much. I weigh —— pounds.

18. I am studying the 120th page of my book. John is only 25% as far. He is on the ——th page.

19. What is the next number below 20 that 6 will exactly divide? Below 38? 26? 45? 33? 57? 50?

20. What is the next number below 24 that 7 will exactly divide? Below 50? 30? 40? 60? 50? 65? 45?

## DRILL

*Divide:*

21.  $6 \overline{)102}$       26.  $6 \overline{)282}$       31.  $6 \overline{)582}$       36.  $7 \overline{)196}$

22.  $6 \overline{)192}$       27.  $6 \overline{)384}$       32.  $6 \overline{)576}$       37.  $7 \overline{)203}$

23.  $6 \overline{)234}$       28.  $6 \overline{)414}$       33.  $7 \overline{)168}$       38.  $7 \overline{)217}$

24.  $6 \overline{)252}$       29.  $6 \overline{)504}$       34.  $7 \overline{)175}$       39.  $7 \overline{)546}$

25.  $6 \overline{)264}$       30.  $6 \overline{)594}$       35.  $7 \overline{)182}$       40.  $7 \overline{)98}$

41. If 6 sleds were sold for \$24, each sled was sold for \$——.

42. If 6 horses were sold for \$564, each horse was sold for \$——.

## LVIII. TIME MEASURES

## MEASURES OF TIME

60 seconds make 1 minute

60 minutes make 1 hour

24 hours make 1 day

7 days make 1 week

365 days make 1 common year

366 days make 1 leap year

100 years make 1 century

1. How many days in 2 common years?
2. How many days in 2 leap years?
3. How many hours in 6 days?
4. How many minutes in 9 hours?
5. How many seconds in 8 minutes?
6. How many days in 1 common year and 17 days?
7. How many hours in 2 days and 4 hours?
8. How many minutes in 3 hours and 19 minutes?
9. How many seconds in 4 minutes and 27 seconds?
10. Find 25% of 60 seconds.
11. 50% of a minute is ——— seconds.
12. 25% of an hour is ——— minutes.
13. 50% of an hour is ——— minutes.
14. 50% of a day is ——— hours.
15. 25% of a day is ——— hours.
16. 50% of a common year is ——— days.

17. 25% of a common year is ——— days,  
 18. 50% of a leap year is ——— days.  
 19. 25% of a leap year is ——— days. (2 divided by 4 is  $\frac{1}{2}$ .)  
 20. What is the next number below 18 exactly divisible by 8? Below 35? 27? 75? 60? 70? 46? 66? 50? 84?

## DRILL

*Divide:*

- |                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| 21. 8) <u>96</u>  | 25. 8) <u>152</u> | 29. 8) <u>112</u> | 33. 8) <u>608</u> |
| 22. 8) <u>136</u> | 26. 8) <u>160</u> | 30. 8) <u>104</u> | 34. 8) <u>552</u> |
| 23. 8) <u>120</u> | 27. 8) <u>176</u> | 31. 8) <u>944</u> | 35. 8) <u>544</u> |
| 24. 8) <u>144</u> | 28. 8) <u>384</u> | 32. 8) <u>856</u> | 36. 8) <u>602</u> |

## LIX. GENERAL PRACTICE

- $\frac{1}{4}$  of 12 is ———.  $\frac{3}{4}$  of 12 are ———.
- $\frac{1}{3}$  of 18 is ———.  $\frac{2}{3}$  of 18 are ———.
- $\frac{1}{5}$  of 30 is ———.  $\frac{2}{5}$  of 30 are ———.  $\frac{3}{5}$  of 30 are ———.  $\frac{4}{5}$  of 30 are ———.
- $\frac{1}{6}$  of 42 is ———.  $\frac{2}{6}$  of 42 are ———.  $\frac{3}{6}$  of 42 are ———.  $\frac{4}{6}$  of 42 are ———.  $\frac{5}{6}$  of 42 are ———.
- $\frac{1}{7}$  of 56 is ———.  $\frac{2}{7}$  of 56 are ———.  $\frac{3}{7}$  of 56 are ———.  $\frac{4}{7}$  of 56 are ———.  $\frac{5}{7}$  of 56 are ———.  $\frac{6}{7}$  of 56 are ———.
- $\frac{1}{8}$  of 32 is ———.  $\frac{2}{8}$  of 32 are ———.  $\frac{3}{8}$  of 32 are ———.  $\frac{5}{8}$  of 32 are ———.  $\frac{7}{8}$  of 32 are ———.

7. I weigh 160 pounds. My son is 25% as heavy. He weighs — pounds.

8. 30 is 25% of —.

9. I have 5 pencils. I have only 25% as many as Jonas has. He has — pencils.

10. Mary has 40 cents. Martha has 50% as many. Martha has — cents.

11. Mr. Jenkins' family uses 2 quarts of milk daily, but that quantity is only 50% as much as his neighbor uses. His neighbor uses — quarts.

12. In 5 weeks there are — days.

13. In 217 days there are — weeks.

14. In 5 centuries there are — years.

15. In 50% of 2 hours there are — minutes.

16. In 25% of 2 hours there are — minutes.

## DRILL

*Divide :*

17.  $2 \overline{)174}$       23.  $4 \overline{)110}$       29.  $4 \overline{)188}$       35.  $6 \overline{)306}$

18.  $2 \overline{)296}$       24.  $4 \overline{)144}$       30.  $4 \overline{)196}$       36.  $6 \overline{)312}$

19.  $3 \overline{)105}$       25.  $4 \overline{)156}$       31.  $5 \overline{)170}$       37.  $6 \overline{)324}$

20.  $3 \overline{)114}$       26.  $4 \overline{)136}$       32.  $5 \overline{)380}$       38.  $6 \overline{)396}$

21.  $3 \overline{)117}$       27.  $4 \overline{)148}$       33.  $5 \overline{)140}$       39.  $6 \overline{)474}$

22.  $4 \overline{)100}$       28.  $4 \overline{)176}$       34.  $5 \overline{)145}$       40.  $6 \overline{)468}$



**LX. FUNDAMENTAL OPERATIONS IN FRACTIONS**

1.  $12 + 4$  means 12 and 4. 12 and 4 are \_\_\_\_.\*
2.  $12 - 4$  means 12 less 4. 12 less 4 are \_\_\_\_.\*
3.  $12 \text{ feet} \times 2$  means 2 times 12 feet. 2 times 12 feet are \_\_\_\_ feet.\*
4.  $12 \text{ feet} \div 2$  means find one half of 12 feet. One half of 12 feet is \_\_\_\_ feet.\*
5.  $12 \text{ feet} \div 2 \text{ feet}$  means find how many times 2 feet are contained in 12 feet. 2 feet are contained in 12 feet \_\_\_\_ times.\*
6. 10 inches + 2 inches means \_\_\_\_.
7. 10 inches - 2 inches means \_\_\_\_.
8. 10 inches  $\times$  2 means \_\_\_\_.
9. 10 inches  $\div$  2 means \_\_\_\_.
10. 10 inches  $\div$  2 inches means \_\_\_\_.
11. 8 twelfths + 4 twelfths means \_\_\_\_.
12. 8 twelfths - 4 twelfths means \_\_\_\_.
13. 8 twelfths  $\times$  4 means \_\_\_\_.
14. 8 twelfths  $\div$  4 means \_\_\_\_.
15. 8 twelfths  $\div$  4 twelfths means \_\_\_\_.

\* In reading these examples require the pupils to read + *plus*, - *minus*,  $\times$  *multiplied by*, and  $\div$  *divided by*.

† Complete as in the first five examples. This work is important, particularly the examples in multiplication and division. Similar work may be put on the blackboard for the pupils to copy and complete.

## DRILL

*Add:*

$$\begin{array}{r} 16. \quad 12\frac{2}{10} \\ \quad 3\frac{1}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 12.2 \\ \quad 3.1 \\ \hline \end{array}$$

$$\begin{array}{r} 8\frac{1}{2} \\ \quad 3\frac{1}{2} \\ \hline \end{array}$$

21. Add in 10 seconds:  
first down, then up.

6

6

$$\begin{array}{r} 17. \quad 7\frac{1}{4} \\ \quad 5\frac{3}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 8.4 \\ \quad 2.6 \\ \hline \end{array}$$

$$\begin{array}{r} 14.3 \\ \quad 5.2 \\ \hline \end{array}$$

6

6

6

*Subtract:*

$$\begin{array}{r} 18. \quad 8\frac{5}{10} \\ \quad 2\frac{1}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 8.5 \\ \quad 2.1 \\ \hline \end{array}$$

$$\begin{array}{r} 14 \\ \quad 2\frac{1}{2} \\ \hline \end{array}$$

6

6

6

6

$$\begin{array}{r} 19. \quad 18 \\ \quad 3\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 18 \\ \quad 3\frac{5}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 18 \\ \quad 3.5 \\ \hline \end{array}$$

6

6

6

$$\begin{array}{r} 20. \quad 17 \\ \quad 4\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 17 \\ \quad 4\frac{2}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 17 \\ \quad 4.2 \\ \hline \end{array}$$

6

1

## LXI. GENERAL PRACTICE

1. 1 pint is ——— of a quart. 1 pint is ——— % of a quart.

2. 1 quart is ——— of a gallon. 1 quart is ——— % of a gallon.

3. 6 hours are ——— of a day. 6 hours are ——— % of a day.

4. 30 minutes are ——— of an hour. 30 minutes are ——— % of an hour.

5. 6 inches are ——— of a foot. 6 inches are ——— % of a foot.

6. Write in figures, using the decimal point : 29 tenths, 6 and 4 tenths, 18 and 9 tenths, 36 tenths, 179 tenths.

7. Read these numbers in two ways : 6.7, 8.5, 64.7, 80.3, 51.6.

8. 6.4 yards  $\div$  4 means ——. 6.4 yards  $\div$  4 = —.

9.  $8\frac{1}{2}$  pounds  $\div$  2 means ——.  $8\frac{1}{2}$  pounds  $\div$  2 = —.

10. 6.4 yards  $\div$  4 yards means ——. 6.4 yards  $\div$  4 yards = —.

11. The sum of 14 yd. and 7 yd. is —.

12. The difference of 14 yd. and 7 yd. is — yd.

13. The product of 14 yd. and 7 yd. is impossible.

14. The product of 14 yd. and 7 is — yd.

15. The quotient of 14 yd. divided by 7 yd. is —.

16. The quotient of 14 yd. divided by 7 is — yd.

17. 19 days are — weeks and — days.

18. 24 days are — weeks and — days.

19. 29 cents are — dimes and — cents.

20. 23 feet are — yards and — feet.

21. 23 pecks are — bushels and — pecks.

### DRILL

*Subtract :*

22.	23	23	23
	$6\frac{1}{4}$	$5\frac{1}{10}$	$6.1$
	<u>        </u>	<u>        </u>	<u>        </u>

23.	18	18	18
	$2.4$	$3.6$	$5.7$
	<u>        </u>	<u>        </u>	<u>        </u>

*Multiply :*

24.	$7\frac{1}{2}$	$8\frac{3}{10}$	8.3
	$2$	$2$	$2$
	<u>        </u>	<u>        </u>	<u>        </u>

25.	$8\frac{1}{2}$	$5\frac{1}{3}$	$7\frac{1}{3}$
	$2$	$2$	$3$
	<u>        </u>	<u>        </u>	<u>        </u>

*Divide :*

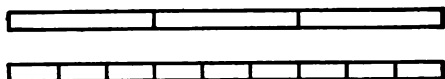
$$26. \quad 3 \text{ ft.}) \underline{18 \text{ ft.}} \qquad 3 \text{ tenths}) \underline{18 \text{ tenths}} \qquad .3) \underline{1.8}$$

$$27. \quad 3) \underline{18 \text{ ft.}} \qquad 3) \underline{18 \text{ tenths}} \qquad 3) \underline{1.8}$$

Give the meaning of the 27th and 28th exercises.

28. Practice Example 21 in Lesson 60.

## LXII. NINTHS



1. In one whole there are — ninths.
2. In one third there are — ninths.
3. In two thirds there are — ninths.
4. One third and one ninth are — ninths.
5. One third and two ninths are — ninths.
6. One third and four ninths are — ninths.
7. One third and five ninths are — ninths.
8. One third less one ninth is — ninths.
9. One third less two ninths is — ninth.
10. Two times two ninths are — ninths.
11. Three times two ninths are — ninths.
12. One ninth is contained in one third — times.
13. Two ninths are contained in four ninths — times.
14. Two ninths are contained in two thirds — times.

15. One third of one third is ———.
16. The sum of  $3\frac{1}{3}$  and  $2\frac{1}{3}$  is ——— and ——— ninths.
17. The difference of  $3\frac{1}{3}$  and  $2\frac{1}{3}$  is ——— and ——— ninths.
18. The product of  $3\frac{2}{3}$  multiplied by 2 is ——— and ——— ninths.
19. The quotient of  $1\frac{2}{3}$  divided by  $\frac{1}{3}$  is ———.
20. The quotient of  $\frac{1}{3}$  divided by 2 is ——— ———.  
( $\frac{1}{2}$  of  $\frac{1}{3}$ .)
21. The quotient of  $9\frac{1}{3}$  divided by 3 is ——— and ——— ———.
22.  $\frac{1}{3}$  of an apple +  $\frac{1}{3}$  of an apple =
23.  $\frac{1}{3}$  of an apple -  $\frac{1}{3}$  of an apple =
24.  $4\frac{1}{3}$  apples +  $\frac{1}{3}$  of an apple = (Meaning:  $\frac{1}{3}$  is contained in  $4\frac{1}{3}$  ——— times.)
25.  $4\frac{1}{3}$  apples ÷ 2 = (Meaning:  $\frac{1}{2}$  of  $4\frac{1}{3}$  apples.)
26. Practice Example 21 in Lesson 60.

### LXIII. DENOMINATE FRACTIONS

1. One yard = ——— feet. Draw a line one yard long and mark it off into feet.
2. One foot is ——— ——— of a yard. Divide each foot of the line you have drawn into thirds.
3. One third of a foot = ——— ——— of a yard.
4. 3 ninths of a yard are one ——— of a yard.  $\frac{3}{9} = \frac{1}{3}$ .
5. 6 ninths of a yard are two ——— of a yard.  $\frac{6}{9} = \frac{2}{3}$ .

6.  $\frac{1}{3}$  of a yd. and  $\frac{1}{9}$  of a yd. =
7.  $\frac{1}{3}$  of a yd. less  $\frac{1}{9}$  of a yd. =
8.  $\frac{2}{9}$  of a yd.  $\times 2 = *$       14.  $5\frac{2}{9} \times 4 =$
9.  $1\frac{2}{9}$  yd.  $\div \frac{1}{9}$  yd. = \*      15.  $4\frac{2}{9} \div 2 = *$
10.  $12\frac{1}{3}$  yd.  $\div 3 = *$       16.  $6\frac{1}{3} \div 2 = *$
11.  $12\frac{1}{3}$  yd.  $\div 2 = *$       17.  $1\frac{1}{9} + \frac{1}{9} = *$
12.  $5\frac{2}{3} + 1\frac{1}{9} =$       18.  $2\frac{1}{3} + \frac{1}{6} = *$
13.  $5\frac{2}{3} - 1\frac{1}{9} =$
19. One of John's strings is  $3\frac{1}{9}$  yd. long. Another is  $4\frac{1}{3}$  yd. long. Both together are — yd. long.
20. From a rope  $8\frac{2}{3}$  yd. long, a piece  $4\frac{1}{9}$  yd. long was cut off. The rope then was — yd. long.
21. My kite string is  $40\frac{2}{3}$  yd. long. Jack's is twice as long. His is — yd. long.
22. The sum of  $6\frac{1}{3}$  yd. and  $4\frac{2}{9}$  yd. is — yards.
23. The difference of  $6\frac{2}{3}$  yd. and  $4\frac{2}{9}$  yd. is — yards.
24. What is the next number below 39 which is exactly divisible by 9? Below 20? 30? 65? 44? 62? 78?

## DRILL

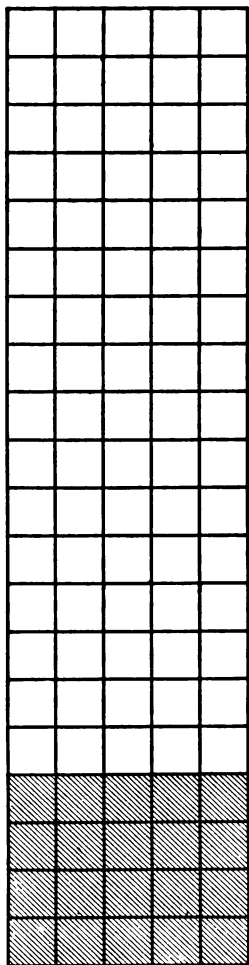
*Divide:*

25.  $9 \overline{)396}$       26.  $9 \overline{)207}$       27.  $9 \overline{)306}$       28.  $9 \overline{)657}$
29.  $9 \overline{)441}$       30.  $9 \overline{)621}$       31.  $9 \overline{)783}$       32.  $9 \overline{)495}$

33. Practice Example 21 in Lesson 60.

\* In case of hesitation, ask for the meaning.

## LXIV. 20 PER CENT



1. With  $a$  as the unit of length, draw a rectangle 5 by 20.

2. Divide it into squares, each as long as  $a$ .

3. In all there are — squares.

4. Each square is — hundredth, or — % of the rectangle.

5. 20 squares are — hundredths, or — % of the rectangle.

6. 20 squares are contained in the rectangle — times.

7. 20 squares are — — of the rectangle.

8.  $20\% =$  — —.

9.  $20\%$  of 25 = — — of 25, or —.

10.  $20\%$  of an hour = — — of 60 minutes, or — minutes.

11.  $20\%$  of a dime = — — of 10 cents, or — cents.

12.  $20\%$  of 30 quarts = —

— of 30 quarts, or — quarts.  $20\%$  of \$300 = —  
— of \$300 or \$ —.

13. 20% of a minute = ——— of 60 seconds, or ——— seconds.

14.  $20\% = \frac{20}{100} = \frac{1}{5}$ .

15. 18 is ——— 5's and ———.

16. 26 is ——— 5's and ———.

17. 32 is ——— 5's and ———.

18. 41 is ——— 5's and ———.

19. 47 is ——— 5's and ———.

20. 27 is ——— 6's and ———.

21. 39 is ——— 6's and ———.

22. 56 is ——— 6's and ———.

23. 45 is ——— 6's and ———.

24. 53 is ——— 6's and ———.

25. 19 is ——— 6's and ———.

26. 16 is ——— 6's and ———.

27. 27 is ——— 4's and ———.

28. 35 is ——— 4's and ———.

29. Try to add in 10 seconds: first down, then up.

6

6

6

6

6

5

4

6

6

6

6

6

6

6

—

30. A farmer bought 40 trees, and 20% of them died. He lost ——— trees.

31. A boy having 35 marbles gave 20% of them to his sister. He gave his sister ——— marbles.

32. A man having 15 cows sold 20% of them. He had ——— cows left.

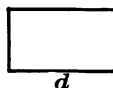
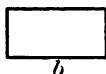
33. 20% of \$60 is \$——.



LXV. MAGNITUDES.  $33\frac{1}{3}$  PER CENT

1. If  $a$  is 1,  
 $b$  is ————,  
 $c$  is ————,  
 and  $d$  is ————  
 ————.

2.  $b =$  ——— %  
 of  $a$ .  $c =$  ——— %  
 of  $a$ .



3. If  $a$  weighs 20 lb.,  $b$  weighs ——— pounds,  $c$  weighs ——— pounds, and  $d$  weighs ——— pounds.

4. If  $a$  costs \$30,  $b$  costs \$——,  $c$  costs \$——, and  $d$  costs \$——.

5. 20% of 20 lb. = ——— pounds.

6. 20% of \$30 = \$——.

7. 50% of 20 pounds = ——— pounds.

8. 50% of \$30 = \$——.

9. 25% of 20 pounds = ——— pounds.

10. 25% of \$30 = \$——.

11.  $b =$  ——— % of  $a$ .

14.  $\frac{1}{2} =$  ——— %.

12.  $c =$  ——— % of  $a$ .

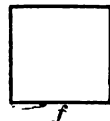
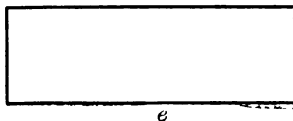
15.  $\frac{1}{4} =$  ——— %.

13.  $d =$  ——— % of  $a$ .

16.  $\frac{1}{5} =$  ——— %.

17.  $e$  is equal to  
 ———  $f$ 's.

18.  $f$  is equal to ———  
 ——— of  $e$ .



19. If  $e = 100$ ,  $f = \text{---}$ .      21.  $\frac{1}{3} = \text{---} \%$ .
20.  $f = \text{---} \%$  of  $e$ .
22.  $33\frac{1}{3}\%$  of 9 =  $\text{---}$  of 9, or  $\text{---}$ .
23.  $33\frac{1}{3}\%$  of \$12 =  $\text{---}$  of \$12, or \$ $\text{---}$ .
24. Mary has 24¢ and Julia has  $33\frac{1}{3}\%$  as much. Julia has  $\text{---}$ ¢.
25. John weighs 60 lb., and his sister weighs  $33\frac{1}{3}\%$  as much. She weighs  $\text{---}$  lb.
26. 50% of 12 quarts is  $\text{---}$  quarts.
27. 25% of 12 quarts is  $\text{---}$  quarts.
28. 20% of 15 quarts is  $\text{---}$  quarts.
29.  $33\frac{1}{3}\%$  of 15 quarts is  $\text{---}$  quarts.

## DRILL

*Divide :*

30.  $5 \overline{)185}$      $5 \overline{)260}$      $5 \overline{)325}$       31.  $5 \overline{)415}$      $5 \overline{)475}$      $6 \overline{)276}$
32.  $6 \overline{)390}$      $6 \overline{)564}$      $6 \overline{)456}$       33.  $6 \overline{)534}$      $6 \overline{)192}$      $6 \overline{)168}$

## LXVI. RATIO

1. If  $a$  represents 4 inches,  $b$  represents  $\text{---}$  inches,  $c$  represents  $\text{---}$  inches, and  $d$  represents  $\text{---}$  inches.
2. If  $a$  represents 25¢,  $b$  represents  $\text{---}$ ¢,  $c$  represents  $\text{---}$ ¢, and  $d$  represents  $\text{---}$ ¢.
3.  $a = \text{---}$  of  $b$ .     $a = \text{---} \%$  of  $b$ .
4.  $a = \text{---}$  of  $c$ .     $a = \text{---} \%$  of  $c$ .

5.  $a = \text{---} \text{---}$  of  $d$ .  $a = \text{---} \%$  of  $d$ .
6. 50% of 100¢ =  $\text{---} \text{---}$  of 100¢, or  $\text{---} \text{¢}$ .
7. 25% of 100¢ =  $\text{---} \text{---}$  of 100¢, or  $\text{---} \text{¢}$ .
8.  $33\frac{1}{3}\%$  of 75¢ =  $\text{---} \text{---}$  of 75¢, or  $\text{---} \text{¢}$ .
9.  $\frac{1}{2}$  is the ratio of  $a$  to  $\text{---}$ .
10.  $\frac{1}{3}$  is the ratio of  $a$  to  $\text{---}$ .
11.  $\frac{1}{4}$  is the ratio of  $a$  to  $\text{---}$ .
12. 2 is the ratio of  $b$  to  $\text{---}$ .
13. 3 is the ratio of  $c$  to  $\text{---}$ .
14. 4 is the ratio of  $d$  to  $\text{---}$ .
15. 50% of 24 ounces =  $\text{---}$  ounces.
16. 25% of 24 ounces =  $\text{---}$  ounces.
17. 20% of 25 ounces =  $\text{---}$  ounces.
18.  $33\frac{1}{3}\%$  of 24 ounces =  $\text{---}$  ounces.
19. 19 pounds are 50% of  $\text{---}$  pounds.
20. 6 pounds are 25% of  $\text{---}$  pounds.
21. 8 pounds are  $33\frac{1}{3}\%$  of  $\text{---}$  pounds.
22. 10 pounds are 20% of  $\text{---}$  pounds.
23. 17 is  $\text{---}$  7's and  $\text{---}$ .
24. 39 is  $\text{---}$  7's and  $\text{---}$ .
25. 27 is  $\text{---}$  7's and  $\text{---}$ .
26. 55 is  $\text{---}$  7's and  $\text{---}$ .
27. 32 is  $\text{---}$  7's and  $\text{---}$ .
28. 48 is  $\text{---}$  7's and  $\text{---}$ .
29. 60 is  $\text{---}$  7's and  $\text{---}$ .
30. 67 is  $\text{---}$  7's and  $\text{---}$ .

DRILL

*Divide :*

31.  $7 \overline{)175}$     $7 \overline{)392}$     $7 \overline{)273}$    32.  $7 \overline{)553}$     $7 \overline{)329}$     $7 \overline{)483}$

33.  $7 \overline{)602}$     $7 \overline{)679}$     $7 \overline{)126}$    34.  $7 \overline{)168}$     $7 \overline{)189}$     $7 \overline{)231}$

35. Practice Example 29 in Lesson 64.

LXVII. TRIANGLES

1. Cut a four-inch square. Draw one diagonal  $a$ .

2. Fold the square on its diagonal. The two triangles are equal.

3.  $c$  is the base;  $b$  is the altitude. The area of the square is — square inches.

4. The area of each triangle is — of the area of the square, or — square inches.

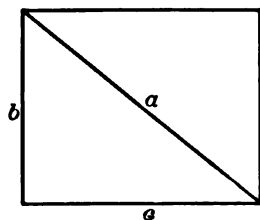
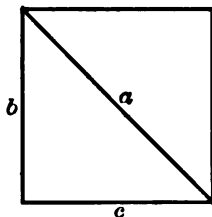
5. Cut a rectangle 4 inches by 5 inches. Fold it on one diagonal  $a$ . The two triangles are equal.

6. The area of the rectangle is — square inches.

7. The area of each triangle is — of the area of the rectangle.

8. The area of the square is the product of  $c$  and  $b$ , or — square inches.

9. The area of each triangle of the square is — of the product of the base and altitude.



10. The area of the rectangle is the product of  $c$  and  $b$ , or — square inches.

11. The area of each triangle of the rectangle is — of the product of the base and altitude.

12. The area of a triangle whose base is 6 ft. and whose altitude is 3 ft. is — square feet.

*Find the area of the triangle :*

13. Whose base is 10 ft. and whose altitude is 6 ft.

14. Whose base is 12 ft. and whose altitude is 8 ft.

15. Whose base is 8 ft. and whose altitude is 6 ft.

16. Whose base is 14 ft. and whose altitude is 4 ft.

17. 19 is — 8's and —.

18. 45 is — 8's and —.

19. 39 is — 8's and —.

20. 28 is — 8's and —.

21. 60 is — 8's and —.

22. 51 is — 8's and —.

23. 69 is — 8's and —.

24. 77 is — 8's and —.

#### DRILL

*Divide :*

25.  $8 \overline{)192}$   $8 \overline{)456}$   $8 \overline{)392}$       26.  $8 \overline{)280}$   $8 \overline{)608}$   $8 \overline{)512}$

27.  $8 \overline{)696}$   $8 \overline{)776}$   $8 \overline{)144}$       28.  $8 \overline{)216}$   $8 \overline{)904}$   $8 \overline{)672}$

29. Practice Example 29 in Lesson 64.

**LXVIII. MULTIPLYING A MIXED NUMBER BY  
A WHOLE NUMBER**

1. 15 halves =  $\frac{15}{2} = 7\frac{1}{2}$ .  $\frac{19}{2} = \text{---}$ .  $\frac{17}{2} = \text{---}$ .

2. 8 thirds =  $\frac{8}{3} = 2\frac{2}{3}$ .  $\frac{11}{3} = \text{---}$ .  $\frac{16}{3} = \text{---}$ .

3. 7 fourths =  $\frac{7}{4} = 1\frac{3}{4}$ .  $\frac{9}{4} = \text{---}$ .  $\frac{19}{4} = \text{---}$ .

*Multiply :*

4.  $18\frac{1}{2}$   
 $\frac{5}{2}$   


---

 $21\frac{1}{2}$   
 90  


---

 $92\frac{1}{2}$

(Change  $\frac{2}{4}$  to  $\frac{1}{2}$ .)

5 times  $\frac{1}{2} = \frac{5}{2} = 2\frac{1}{2}$ .  
 5 times 18 = 90.

9.  $28\frac{1}{4}$   
 $\frac{6}{4}$   


---

10.  $23\frac{2}{3}$   
 $\frac{7}{3}$   


---

11.  $20\frac{3}{4}$   
 $\frac{6}{4}$   


---

5.  $24\frac{2}{3}$   
 $\frac{4}{3}$   


---

 $2\frac{2}{3}$   
 96  


---

 $98\frac{2}{3}$

4 times  $\frac{2}{3} = \frac{8}{3} = 2\frac{2}{3}$ .  
 4 times 24 = 96.

12.  $24\frac{1}{2}$   
 $\frac{8}{2}$   


---

13.  $38\frac{1}{3}$   
 $\frac{5}{3}$   


---

6.  $18\frac{3}{4}$   
 $\frac{5}{4}$   


---

 $3\frac{3}{4}$   
 90  


---

 $93\frac{3}{4}$

5 times  $\frac{3}{4} = \frac{15}{4} = 3\frac{3}{4}$ .  
 5 times 18 = 90.

14.  $80\frac{2}{3}$   
 $\frac{6}{3}$   


---

15.  $73\frac{3}{4}$   
 $\frac{4}{4}$   


---

7.  $21\frac{1}{3}$   
 $\frac{4}{3}$   


---

16.  $15\frac{1}{2}$   
 $\frac{6}{2}$   


---

8.  $62\frac{1}{2}$   
 $\frac{5}{2}$   


---

17.  $40\frac{2}{3}$   
 $\frac{7}{3}$   


---

18. 12 is — 9 and —.

19. 20 is — 9's and —.

20. 39 is — 9's and —.

21. 29 is — 9's and —.

22. 69 is — 9's and —.

23. 49 is — 9's and —.

24. 76 is — 9's and —.

25. 59 is — 9's and —.

26. 85 is — 9's and —.

30. Try to add  
first down, then up,  
in 10 seconds:

6

6

6

5

4

6

6

3

2

6

6

1

6

6

—

## DRILL

*Divide:*27.  $9 \overline{)126}$        $9 \overline{)207}$        $9 \overline{)396}$ 28.  $9 \overline{)297}$        $9 \overline{)693}$        $9 \overline{)495}$ 29.  $9 \overline{)765}$        $9 \overline{)594}$        $9 \overline{)855}$ 

## LXIX. FUNDAMENTAL OPERATIONS IN FRACTIONS

1.  $\$8 + \$7$  means —.  $\$8$  and  $\$7 =$  (See Lesson 60.)2.  $\$8 - \$7$  means —.  $\$8$  less  $\$7 =$ 3.  $\$8 \times 3$  means —. 3 times  $\$8 =$ 4.  $\$8 \div 3$  means —.  $\frac{1}{3}$  of  $\$3 =$  ( $\frac{1}{3}$  of  $2 = \frac{2}{3}$ .)5.  $\$8 \div \$3$  means —.  $\$3$  are contained in  $\$8$  — times.6.  $\$ \frac{1}{2} + \$ \frac{1}{6}$  means —.  $\$ \frac{1}{2}$  and  $\$ \frac{1}{6} =$

7.  $\$ \frac{1}{2} - \$ \frac{1}{6}$  means ——.  $\$ \frac{1}{2}$  less  $\$ \frac{1}{6} =$
8.  $\$ \frac{1}{2} \times 3$  means ——. 3 times  $\$ \frac{1}{2} =$
9.  $\$ \frac{1}{2} \div \$ \frac{1}{6}$  means ——.  $\$ \frac{1}{6}$  is contained in  $\$ \frac{1}{2}$  —  
times.
10.  $\$ \frac{1}{2} \div 3$  means ——.  $\frac{1}{3}$  of  $\$ \frac{1}{2} =$
11.  $\$.8 + \$.2$  means ——.  $\$.8$  and  $\$.2 =$
12.  $\$.8 - \$.2$  means ——.  $\$.8$  less  $\$.2 =$
13.  $\$.8 \times 3$  means ——. 3 times  $\$.8 =$
14.  $\$.8 \div 2$  means ——.  $\frac{1}{2}$  of  $\$.8 =$
15.  $\$.8 \div \$.2$  means ——.  $\$.2$  are contained —.
16. A man paid  $\$3.20$  for a dog and  $\$.75$  for a cat. He paid \$—— for both.
17. James paid  $\$4.30$  for a sled and sold it for  $\$2.20$ . He lost \$——.
18. Joseph spent  $\$.4$  a day for 5 days. He spent \$——.
19. When butter is  $\$.3$  a pound, for  $\$2.1$  I can buy — pounds.
20. I paid  $\$3.6$  for 9 pounds of butter. Each pound cost \$——. ( $\frac{1}{9}$  of 36 tenths is —.)

DRILL

Add:

$$\begin{array}{r} 21. \quad 20\frac{1}{5} \\ \quad \quad 6\frac{3}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 16\frac{2}{3} \\ \quad \quad 5\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 22. \quad 17\frac{1}{2} \\ \quad \quad 3\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 10\frac{3}{4} \\ \quad \quad 5\frac{1}{4} \\ \hline \end{array}$$



*Subtract :*

$$\begin{array}{r} 23. \quad 18\frac{1}{2} \quad 19\frac{1}{2} \\ \quad \quad 3\frac{1}{3} \quad 3\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 24. \quad 14\frac{1}{3} \quad 17\frac{3}{4} \\ \quad \quad 2\frac{1}{6} \quad 6\frac{1}{4} \\ \hline \end{array}$$

*Multiply :*

$$\begin{array}{r} 25. \quad 10\frac{1}{2} \quad 13\frac{1}{3} \\ \quad \quad 3 \quad 2 \\ \hline \end{array}$$

$$\begin{array}{r} 26. \quad 17.1 \quad 16\frac{1}{8} \\ \quad \quad 3 \quad 4 \\ \hline \end{array}$$

*Divide :*

$$27. \quad 5 \text{ tenths } \overline{)15 \text{ tenths}} \quad .6 \overline{)1.8} \quad .4 \overline{)2.4}$$

$$28. \quad 3 \overline{)3.6} \quad .2 \overline{)1.6} \quad 2 \overline{)1.6}$$

29. Give the meaning of the examples in the 27th and 28th exercises.

30. John had a rope  $18\frac{1}{2}$  ft. long, but cut off a piece  $3\frac{1}{3}$  ft. long for his brother. How long is John's rope now ?

31. Mr. Johnson bought 3 calves, paying  $\$10\frac{1}{2}$  apiece for them. How many dollars did they all cost him ?

32. A dealer paid  $\$1.5$  for some knives, paying  $\$.5$  apiece. How many knives did he buy ?

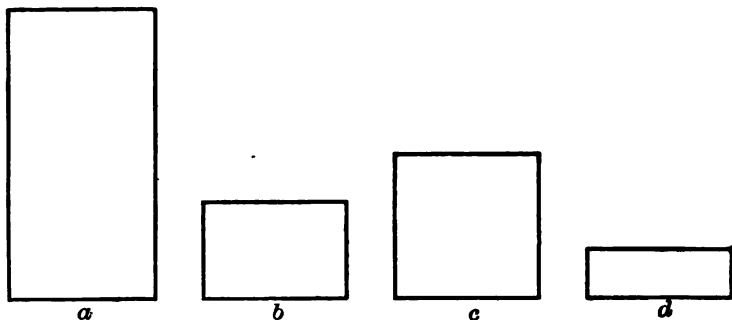
33. A wire 3.6 ft. long was cut into 3 equal pieces. How long was each piece ?

34. A string 2.5 ft. long was cut into pieces each .5 ft. in length. How many pieces were there ?

35.  $\$8.4$  divided by  $\$.3 = \text{---}$ .

36. Practice Example 30 in Lesson 68.

## LXX. MAGNITUDES. RATIO



1. If  $a$  is 1,  $b$  is ———,  $c$  is ———, and  $d$  is ———.

2.  $a =$  ———  $b$ 's.  $a =$  ———  $c$ 's.  $a =$  ———  $d$ 's.

3. If  $a$  is called 2,  $b$  must be called ——— thirds.  $\frac{2}{3}$  means  $\frac{1}{3}$  of 2.

4.  $c$  must be called ———, and  $d$  must be called ———.

5. If we call  $d$  4, we must call  $c$  ———,  $b$  ———, and  $a$  ———.

6. If we call  $d$  4, which of these units can be exactly measured by 8?

7.  $d =$  ——— of  $c$ , and ——— of  $b$ .

8.  $c =$  ——— times  $d$ , ——— of  $b$ , and ——— of  $a$ .

9.  $b =$  ——— times  $d$ , ——— of  $c$ , and ——— of  $a$ .

10. If  $a$  represents 1 hour,  $b$  represents ——— minutes,  $c$  represents ——— minutes, and  $d$  represents ——— minutes.

11. If  $a$  represents 1 day,  $b$  represents ——— hours,  $c$  represents ——— hours, and  $d$  represents ——— hours.

12. If  $a$  represents 1 year,  $b$  represents — months,  $c$  represents — months, and  $d$  represents — months.

13.  $b$  equals — % of  $a$ ,  $c$  equals — % of  $a$ , and  $d$  equals — % of  $a$ .       $6 \overline{)100}$

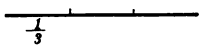
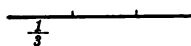
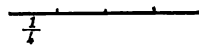
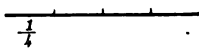
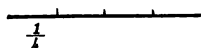
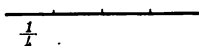
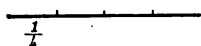
14.  $b =$  — % of  $a$ .      17.  $d$  is — % as large as  $c$ .

15.  $c =$  — % of  $a$ .      18.  $b$  is — % as large as  $c$ .

16.  $d =$  — % of  $a$ .

19. Practice Example 30 in Lesson 68.

### LXXI. REMAINDER IN DIVISION



1.  $\frac{1}{4}$  of 2 = — fourths, or — half.     $2 \div 4 =$      $4 \overline{)2}$

2.  $\frac{1}{4}$  of 3 = — fourths.     $3 \div 4 =$      $4 \overline{)3}$

3.  $\frac{1}{3}$  of 2 = — thirds.     $2 \div 3 =$      $3 \overline{)2}$

4. 2 is contained in 7 — times and — over.

5. 2 is contained in 7 — and — — times.

6. 3 is contained in 16 — times and — over.

7. 3 is contained in 16 — and — — times.

8. 3 is contained in 17 — times and — over.

9. 3 is contained in 17 — and — — times.

10. 4 is contained in 21 — times and — over.  
11. 4 is contained in 21 — and — — times.  
12. 4 is contained in 18 — times and — over.  
13. 4 is contained in 18 — and — — times.  
(Change  $\frac{2}{4}$  to  $\frac{1}{2}$ .)

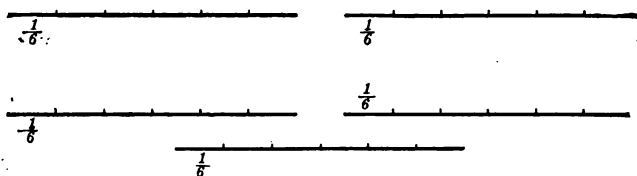
14. 4 is contained in 23 — times and — over.  
15. 4 is contained in 23 — and — — times.  
16. 5 is contained in 26 — times and — over.  
17. 5 is contained in 26 — and — — times.  
18. 5 is contained in 37 — times and — over.  
19. 5 is contained in 37 — and — — times.

## DRILL

*Divide :*

20.  $2)\underline{145}$     $2)\underline{39}$     $2)\underline{67}$       22.  $4)\underline{145}$     $4)\underline{158}$     $4)\underline{279}$   
21.  $3)\underline{136}$     $3)\underline{146}$     $3)\underline{151}$       23.  $5)\underline{376}$     $5)\underline{263}$     $5)\underline{294}$   
24. \$145 were divided equally between 2 men. How much was given to each?  
25. An employer had \$145 with which to pay some laborers, giving each \$2. How many laborers were there, and how much money had he left?  
26. 261 bu. of potatoes were sold in equal quantities to 3 men. How many bushels to each?  
27. \$257 will pay how many men \$3 each? How much money will be left?  
28. Practice Example 16 in Lesson 40.

## LXXII. REMAINDER IN DIVISION



1.  $\frac{1}{6}$  of 2 = — sixths, or — third.  $2 \div 6 = 6 \overline{)2}$

2.  $\frac{1}{6}$  of 3 = — sixths, or — half.  $3 \div 6 = 6 \overline{)3}$

3. 6 is contained in 19 — times and — over.

4. 6 is contained in 19 — and — — times.

5. 6 is contained in 26 — times and — over.

6. 6 is contained in 26 — and — — times.

(Change  $\frac{2}{6}$  to  $\frac{1}{3}$ .)

7. 6 is contained in 45 — times and — over.

8. 6 is contained in 45 — and — — times.

(Change  $\frac{3}{6}$  to  $\frac{1}{2}$ .)

9. 6 is contained in 58 — times and — over.

10. 6 is contained in 58 — and — — times.

(Change  $\frac{4}{6}$  to  $\frac{2}{3}$ .)

11. 6 is contained in 59 — times and — over.

12. 6 is contained in 59 — and — — times.

13. 7 is contained in 8 — and — — times.

14. 7 is contained in 16 — and — — times.

15. 7 is contained in 24 — and — — times.

16. 7 is contained in 32 — and — — times.  
 17. 7 is contained in 54 — and — — times.  
 18. 7 is contained in 41 — and — — times.  
 19. 8 is contained in 9 — and — — times.  
 20. 8 is contained in 26 — and — — times.  
 (Change  $\frac{2}{8}$  to  $\frac{1}{4}$ .)  
 21. 8 is contained in 19 — and — — times.  
 22. 8 is contained in 36 — and — — times.  
 (Change  $\frac{4}{8}$  to  $\frac{1}{2}$ .)

## DRILL

*Divide :*

23.  $6 \overline{)193}$   $6 \overline{)560}$   $6 \overline{)339}$       26.  $7 \overline{)516}$   $7 \overline{)320}$   $8 \overline{)625}$   
 24.  $6 \overline{)748}$   $6 \overline{)623}$   $7 \overline{)435}$       27.  $8 \overline{)234}$   $8 \overline{)339}$   $8 \overline{)572}$   
 25.  $7 \overline{)324}$   $7 \overline{)346}$   $7 \overline{)235}$       28.  $8 \overline{)294}$   $8 \overline{)312}$   $8 \overline{)304}$   
 29. Practice Example 20 in Lesson 60.

## LXXIII. REMAINDER IN DIVISION

1. 8 is contained in 45 — and — — times.  
 2. 8 is contained in 38 — and — — times.  
 ( $\frac{6}{8} = \frac{3}{4}$ .)  
 3. 8 is contained in 47 — and — — times.  
 4. 9 is contained in 19 — and — — times.  
 5. 9 is contained in 29 — and — — times.

6. 9 is contained in 39 — and — — times.  
 $(\frac{3}{9} = \frac{1}{3}.)$

7. 9 is contained in 49 — and — — times.

8. 9 is contained in 77 — and — — times.

9. 9 is contained in 69 — and — — times.  
 $(\frac{6}{9} = \frac{2}{3}.)$

10. 9 is contained in 61 — and — — times.

11. 9 is contained in 80 — and — — times.

*Divide:*

12.  $9 \overline{)433}$      $9 \overline{)551}$      $9 \overline{)336}$     14.  $9 \overline{)538}$      $9 \overline{)548}$      $8 \overline{)645}$

13.  $9 \overline{)292}$      $9 \overline{)446}$      $9 \overline{)366}$     15.  $8 \overline{)526}$      $8 \overline{)479}$      $8 \overline{)728}$

16. At \$9 each how many sheep can be bought for \$648?

17. Find the cost of 9 cows at \$37 each.

18. If 9 cows cost \$243, one cow will cost \$——.

19. 8 desks at \$28 each will cost \$——.

20. If 8 desks cost \$240, one desk will cost \$——.

21. If \$8 are paid for one book, \$360 will pay for —— books.

22.  $\frac{28}{9} =$

24.  $\frac{675}{9} =$

26.  $\frac{752}{8} =$

23.  $\frac{243}{9} =$

25.  $\frac{433}{9} =$

27.  $\frac{59}{8} =$

28. Practice Example 29 in Lesson 64.

**LXXIV. MULTIPLICATION TABLES. TWO TO SEVEN**

Read the following tables first, then write them :

- |                  |                 |
|------------------|-----------------|
| 1. 1 two is —.   | 3. 1 four is —. |
| 2 twos are —.    | 2 fours are —.  |
| 3 twos are —.    | 3 fours are —.  |
| 4 twos are —.    | 4 fours are —.  |
| 5 twos are —.    | 5 fours are —.  |
| 6 twos are —.    | 6 fours are —.  |
| 7 twos are —.    | 7 fours are —.  |
| 8 twos are —.    | 8 fours are —.  |
| 9 twos are —.    | 9 fours are —.  |
| 10 twos are —.   | 10 fours are —. |
| 11 twos are —.   | 11 fours are —. |
|                  | 12 fours are —. |
| 2. 1 three is —. | 4. 1 five is —. |
| 2 threes are —.  | 2 fives are —.  |
| 3 threes are —.  | 3 fives are —.  |
| 4 threes are —.  | 4 fives are —.  |
| 5 threes are —.  | 5 fives are —.  |
| 6 threes are —.  | 6 fives are —.  |
| 7 threes are —.  | 7 fives are —.  |
| 8 threes are —.  | 8 fives are —.  |
| 9 threes are —.  | 9 fives are —.  |
| 10 threes are —. | 10 fives are —. |
| 11 threes are —. | 11 fives are —. |
| 12 threes are —. | 12 fives are —. |



- |                 |                  |
|-----------------|------------------|
| 5. 1 six is —.  | 6. 1 seven is —. |
| 2 sixes are —.  | 2 sevens are —.  |
| 3 sixes are —.  | 3 sevens are —.  |
| 4 sixes are —.  | 4 sevens are —.  |
| 5 sixes are —.  | 5 sevens are —.  |
| 6 sixes are —.  | 6 sevens are —.  |
| 7 sixes are —.  | 7 sevens are —.  |
| 8 sixes are —.  | 8 sevens are —.  |
| 9 sixes are —.  | 9 sevens are —.  |
| 10 sixes are —. | 10 sevens are —. |
| 11 sixes are —. | 11 sevens are —. |
| 12 sixes are —. | 12 sevens are —. |

**LXXV. EIGHT TO TWELVE**

Read the following tables first, then write them:

- |                  |                 |
|------------------|-----------------|
| 1. 1 eight is —. | 2. 1 nine is —. |
| 2 eights are —.  | 2 nines are —.  |
| 3 eights are —.  | 3 nines are —.  |
| 4 eights are —.  | 4 nines are —.  |
| 5 eights are —.  | 5 nines are —.  |
| 6 eights are —.  | 6 nines are —.  |
| 7 eights are —.  | 7 nines are —.  |
| 8 eights are —.  | 8 nines are —.  |
| 9 eights are —.  | 9 nines are —.  |
| 10 eights are —. | 10 nines are —. |
| 11 eights are —. | 11 nines are —. |
| 12 eights are —. | 12 nines are —. |

3. 1 ten is —.

2 tens are —.

3 tens are —.

4 tens are —.

5 tens are —.

6 tens are —.

7 tens are —.

8 tens are —.

9 tens are —.

10 tens are —.

11 tens are —.

12 tens are —.

4. 1 eleven is —.

2 elevens are —.

3 elevens are —.

4 elevens are —.

5 elevens are —.

6 elevens are —.

7 elevens are —.

8 elevens are —.

9 elevens are —.

10 elevens are —.

11 elevens are —.

12 elevens are —.

5. 1 twelve is —.

2 twelves are —.

3 twelves are —.

4 twelves are —.

5 twelves are —.

6 twelves are —.

7 twelves are —.

8 twelves are —.

9 twelves are —.

10 twelves are —.

11 twelves are —.

12 twelves are —.

7

7

7

7

7

7

7

7

7

7

7

7

7

7

1

6. Try to add the column shown above in 10 seconds: first down, then up.

**LXXVI. SUM, DIFFERENCE, PRODUCT, QUOTIENT**

1. The sum of \$11 and \$5 is \$ —.
2. Find the sum of \$57 and \$43.
3. The difference of \$18 and \$5 is \$ —.
4. The difference of \$93 and \$27 is \$ —.
5. A woman bought 2 yards of cloth at 5¢ a yard, and 3 papers of needles at 10¢ a paper. Her bill was —¢.
6. A boy paid 20¢ for a ball and 32¢ for a knife. He paid —¢ more for the knife than for the ball.
7. Alice had half a dollar. She spent 1 fifth of a dollar. She had — cents left.
8. The product of 9 quarts and 3 is — quarts.
9. The product of 29 quarts and 5 is — quarts.
10. The quotient of 30 gallons divided by 10 gallons is —.
11. The quotient of 87 gallons divided by 3 gallons is —.
12. A boy carried 11 quarts of water from the well. He did this 3 times. In all he carried — quarts.
13. Julia carried 60 apples into the house by making 6 trips for them. Each trip she carried — apples.
14. From a quarter of a dollar a boy paid out 1 tenth of a dollar. He had —¢ left.
15. 18 gallons of kerosene will fill how many 3-gallon cans?
16. Practice the 6th Example in Lesson 75.

# LXXVII. MULTIPLYING A WHOLE NUMBER BY A MIXED NUMBER

1. Three and one half times 8 means 3 8's and 1 half of 8.  $3\frac{1}{2}$  times 8 =

2.  $10 \times 3\frac{1}{2}$  means  $3\frac{1}{2}$  times 10, or 3 10's and  $\frac{1}{2}$  of 10.  $10 \times 3\frac{1}{2}$  =

3.  $8 \times 5\frac{1}{2}$  means ———. (Complete the statement.)

4. 6 lb. at 12¢ a pound.  $12 \times 6$  =

5. 2 lb. at  $2\frac{1}{2}$ ¢ a pound.  $2\frac{1}{2} \times 2$  =

6.  $2\frac{1}{2}$  lb. at 10¢ a pound.  $10 \times 2\frac{1}{2}$  =

7.  $2\frac{1}{4}$  lb. at 12¢ a pound.  $12 \times 2\frac{1}{4}$  =

8.  $16 \times \frac{1}{2}$  means  $\frac{1}{2}$  of 16.  $16 \times \frac{1}{2}$  =

9.  $20 \times \frac{1}{4}$  means ———.  $20 \times \frac{1}{4}$  =

10.  $12 \times \frac{1}{3}$  means ———.  $12 \times \frac{1}{3}$  =

*Multiply :*

11. 48

$$\begin{array}{r} 2\frac{1}{2} \\ \hline \end{array}$$

24  $\frac{1}{2}$  of 48 is 24.

96 2 times 48 are 96.

120  $2\frac{1}{2}$  times 48 are 120.

12. 84

$$\begin{array}{r} 2\frac{1}{2} \\ \hline \end{array}$$

13. 18

$$\begin{array}{r} 3\frac{1}{2} \\ \hline \end{array}$$

14. 34

$$\begin{array}{r} 3\frac{1}{2} \\ \hline \end{array}$$

15. 84

$$\begin{array}{r} 2\frac{1}{3} \\ \hline \end{array}$$

16. 51

$$\begin{array}{r} 3\frac{1}{3} \\ \hline \end{array}$$

17. 72

$$\begin{array}{r} 2\frac{1}{3} \\ \hline \end{array}$$

18. 36

$$\begin{array}{r} 3\frac{1}{4} \\ \hline \end{array}$$

19. 28

$$\begin{array}{r} 4\frac{1}{4} \\ \hline \end{array}$$

20. 63

$$\begin{array}{r} 2\frac{1}{3} \\ \hline \end{array}$$

21. 45

$$\begin{array}{r} 5\frac{1}{3} \\ \hline \end{array}$$

22. Practice the 6th Example in Lesson 75.

## LXXVIII. DENOMINATE NUMBERS

1.  $\frac{1}{3}$  of a ft. +  $\frac{1}{4}$  of a ft. =  $\frac{1}{12}$  of a ft.  $2\frac{1}{3} + 6\frac{1}{4} =$
2.  $\frac{1}{3}$  of a ft. +  $\frac{1}{4}$  of a ft. = — inches.  $6\frac{1}{3} - 2\frac{1}{4} =$
3.  $\frac{1}{3}$  of a ft. -  $\frac{1}{4}$  of a ft. = — of a ft.
4.  $\frac{7}{12}$  of a ft.  $\times 2 = \frac{1}{12}$  of a ft., — ft. and — inches.  
 $8\frac{7}{12} \times 2 =$
5.  $2\frac{1}{6}$  ft. +  $\frac{1}{6}$  of a ft. = —.  $3\frac{1}{6} \div \frac{1}{6} =$
6.  $4\frac{1}{2}$  ft. + 2 = — ft.  $4\frac{1}{4} \div 2 =$
7. 13 inches are — and — — ft.  $\frac{13}{12} = 1\frac{1}{12}$ .
8. 14 inches are — and — — ft.  $\frac{14}{12} = \frac{7}{6}$ .
9. 15 inches are — and — — ft.  $\frac{15}{12} =$
10. 16 inches are — and — — ft.  $\frac{16}{12} =$
11. Draw a half foot square. 15. 7 16. 7  
 Its area is — square inches. 7 7  
 Its perimeter is — inches. 7 7
12. Draw a  $\frac{1}{3}$  ft. square. Its 7 7  
 area is — square inches. Its 7 7  
 perimeter is — inches. 7 7
13. If from a line 2 ft. long 7 7  
 you take off  $\frac{5}{12}$  of a foot, you 7 7  
 will leave — and — — 7 7  
 feet. 7 7
14. If to a line  $\frac{5}{12}$  of a ft. 7 7  
 long I tie a line  $\frac{1}{3}$  of a ft. long, 7 7  
 I shall have a line — — 7 7  
 of a ft. long. 2 3

Try to add each column in 10 seconds: first down, then up.

**LXXIX. REVIEW**

*Find the sum of:*

- |                             |                              |                             |                     |
|-----------------------------|------------------------------|-----------------------------|---------------------|
| 1. $12\frac{1}{2}$          | 2. $28\frac{1}{4}$           | 3. $49\frac{1}{3}$          | 4. 36 and 2 tenths, |
| $\underline{86\frac{1}{2}}$ | $\underline{42\frac{7}{12}}$ | $\underline{28\frac{1}{2}}$ | and 17.9.           |

*Find the difference of:*

- |                              |                              |                    |                   |
|------------------------------|------------------------------|--------------------|-------------------|
| 5. 84                        | 6. 97                        | 7. 89              | 8. 92, and 83 and |
| $\underline{17\frac{5}{12}}$ | $\underline{34\frac{3}{10}}$ | $\underline{34.3}$ | 4 tenths.         |

*Find the product of:*

- |                     |                      |                 |                     |
|---------------------|----------------------|-----------------|---------------------|
| 9. $16\frac{1}{12}$ | 10. $89\frac{1}{10}$ | 11. 89.1        | 12. 63 and 4 tenths |
| $\underline{4}$     | $\underline{5}$      | $\underline{5}$ | multiplied by 3.    |

*Find the quotient of:*

- |   |  |
|---|--|
| 13. 7 bu.) $\underline{63 \text{ bu.}}$ | 15. 8 tenths) $\underline{72 \text{ tenths.}}$ |
| 14. 7) $\underline{63 \text{ bu.}}$     | 16. 84 tenths divided by 7.                    |
17. Practice Examples 15 and 16 in Lesson 78.

**LXXX. REVIEW**

- Add 6 gallons, 5 gallons, and 3 gallons.
- Add 84 gallons, 75 gallons, and 96 gallons.
- From 15 quarts subtract 9 quarts.
- From 784 quarts subtract 259 quarts.
- Multiply 8 pints by 4.
- Multiply 89 pints by 7.
- Divide 63 bushels by 9 bushels.

8. Divide 567 bushels by 9 bushels.
9. Divide 32 pecks by 4.
10. Divide 325 pecks by 5.
11. At 12¢ a pound, 3 pounds of meat cost — ¢.
12. At \$36 each, 9 cows cost \$——.
13.  $\frac{2}{3}$  of 21 books are — books.
14.  $\frac{2}{3}$  of 216 pounds are — pounds.
15. 8 books are  $\frac{2}{3}$  of — books.
16. 84 books are  $\frac{2}{3}$  of — books.
17.  $\frac{3}{4}$  of \$12 are — dollars.
18.  $\frac{3}{4}$  of \$128 are — dollars.
19. \$12 are  $\frac{3}{4}$  of \$——.
20. \$84 are  $\frac{3}{4}$  of \$——.
21. I paid \$200 for a horse. I paid \$100 for keeping him 1 year. Then I sold him for \$400. I gained \$——.
22. Anna owes a bill of \$1.40. She offered a \$2 bill in payment. She should receive — ¢ in change.
23. Practice Examples 15 and 16 in Lesson 78.

#### LXXXI. RECTANGLES. REDUCTION OF FRACTIONS

1. Take your foot rule, or a yard stick, and measure a distance of  $16\frac{1}{2}$  feet. This distance is 1 rod.
2. A farmer has a rectangular lot which is 4 rods wide and 6 rods long. Its area is — square rods. Its perimeter is — rods.

3. How many rods of fence will inclose a rectangular lot which is 7 rods by 8 rods?

4. It is 4 rods from Mr. Greene's house to his corn crib. How many feet is that?

5. How many feet in the perimeter of a rectangular lot which is 8 rods by 1 rod?

6. How many feet in the perimeter of a rectangular lot 12 rods by 4 rods?

7. Find the area of a rectangle 4 rods long and 33 feet wide.

8. Find the area of a rectangle 3 rods by 2 rods. How many feet in its perimeter?

17. Try to add this column in 10 seconds: first down, then up.

9.  $4\frac{1}{3} = \text{--- thirds.}$   $5\frac{2}{3} = \text{---}$   
thirds.

10.  $5\frac{1}{2} = \text{--- halves.}$   $3\frac{1}{4} = \text{---}$   
fourths.

11.  $4\frac{3}{4} = \text{--- fourths.}$   $5\frac{3}{4} = \text{---}$   
fourths.

12.  $2\frac{1}{5} = \text{--- fifths.}$   $2\frac{2}{5} = \text{---}$   
fifths.

13.  $2\frac{3}{5} = \text{--- fifths.}$   $3\frac{2}{5} = \text{---}$   
fifths.

14.  $\frac{11}{2} = \text{---.}$   $\frac{13}{3} = \text{---.}$

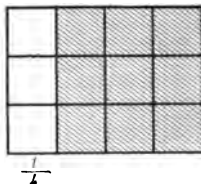
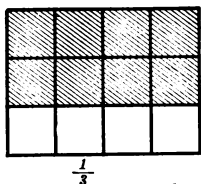
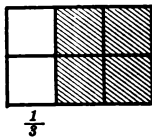
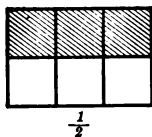
15.  $\frac{14}{8} = \text{---.}$   $\frac{19}{4} = \text{---.}$

16.  $\frac{17}{4} = \text{---.}$   $\frac{11}{8} = \text{---.}$

7  
7  
7  
7  
7  
7  
7  
6  
5  
4  
3  
2  
1  
—



## LXXXII. SIXTHS, TWELFTHS



1.  $\frac{1}{2} + \frac{1}{3} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6}$ .

3.  $\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$ .

2.  $\frac{1}{2} - \frac{1}{3} = \frac{2}{6} - \frac{1}{6} = \frac{1}{6}$ .

4.  $\frac{1}{3} - \frac{1}{4} = \frac{4}{12} - \frac{3}{12} = \frac{1}{12}$ .

5. Add  $\frac{2}{3}$  and  $\frac{1}{4}$ .

 $\frac{2}{3}$  equal — twelfths. $\frac{1}{4}$  equals — twelfths.

— twelfths and — twelfths equal — twelfths.

6. From  $\frac{3}{4}$  subtract  $\frac{2}{3}$ .

 $\frac{3}{4}$  equal — twelfths. $\frac{2}{3}$  equal — twelfths.

— twelfths less — twelfths equal — twelfths.

7.  $\frac{3}{4}$  of a dozen and 1 third of a dozen are — twelfths of a dozen.8.  $\frac{3}{4}$  of a dozen less 1 third of a dozen are — twelfths of a dozen.9.  $\frac{3}{4}$  of a dozen and  $\frac{2}{3}$  of a dozen are — and — — dozen.

10. Practice Example 17 in Lesson 81.

## DRILL

*Add:*

$$\begin{array}{r} 11. \quad 5\frac{1}{2} \\ \quad 6\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 7\frac{1}{3} \\ \quad 3\frac{1}{4} \\ \hline \end{array}$$

*Subtract:*

$$\begin{array}{r} 13. \quad 8\frac{1}{2} \\ \quad 5\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 9\frac{1}{3} \\ \quad 6\frac{1}{4} \\ \hline \end{array}$$

*Multiply:*

$$\begin{array}{r} 15. \quad 18\frac{1}{2} \\ \quad \quad 5 \\ \hline \end{array}$$

$$\begin{array}{r} 16. \quad 14\frac{1}{3} \\ \quad \quad 4 \\ \hline \end{array}$$

*Divide:*

$$17. \quad 2 \overline{)18\frac{1}{2}}$$

$$18. \quad 2 \overline{)288\frac{1}{3}}$$

NOTE. — Require pupils to make the four drawings.

## LXXXIII. NINTHS

1.  $\frac{1}{3} + \frac{1}{9} = \frac{1}{9} + \frac{1}{9} = \frac{2}{9}$ .

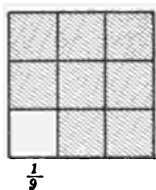
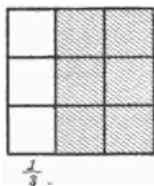
2.  $\frac{1}{3} - \frac{1}{9} = \frac{2}{9} - \frac{1}{9} = \frac{1}{9}$ .

3. Add  $\frac{2}{3}$  and  $\frac{2}{9}$ .

$\frac{2}{3}$  equal — ninths.

— ninths and 2 ninths

are — ninths.



4. From  $\frac{2}{3}$  subtract  $\frac{2}{9}$ .

$\frac{2}{3}$  equal — ninths.

— ninths less 2 ninths equal — ninths.

5.  $\frac{1}{3}$  of a year +  $\frac{1}{4}$  of a year = — — of a year.

$\frac{1}{3} + \frac{1}{4} =$

6.  $\frac{1}{3}$  of a year +  $\frac{1}{4}$  of a year = — months.

7.  $\frac{1}{3}$  of a year -  $\frac{1}{4}$  of a year = — — of a year.

$\frac{1}{3} - \frac{1}{4} =$

8.  $\frac{1}{3}$  of a year -  $\frac{1}{4}$  of a year = — month.

9.  $\frac{1}{3}$  of a year  $\times 5 =$  — and — — years.  $\frac{1}{3} \times 5 =$

10.  $\frac{1}{3}$  of a year  $\times 5 =$  — months.

11.  $\frac{1}{3}$  of a year  $\times 9\frac{1}{2} = \text{---}$  and  $\text{---}$  years.\*  
 $\frac{1}{3} \times 9\frac{1}{2} =$

12.  $\frac{1}{3}$  of a year  $+ \frac{1}{6}$  of a year  $= \text{---}$ .  $\frac{1}{3} + \frac{1}{6} =$

13.  $\frac{1}{3}$  of a year  $\div 3 = \text{---}$  of a year.  $\frac{1}{3} \div 3 =$

## DRILL

Add:

14.  $6\frac{1}{3}$   
 $4\frac{1}{9}$

15.  $7\frac{2}{3}$   
 $4\frac{2}{9}$

Subtract:

16.  $9\frac{1}{3}$   
 $2\frac{1}{9}$

17.  $8\frac{2}{3}$   
 $3\frac{2}{9}$

Multiply:

18.  $\frac{1}{3} \times 6\frac{1}{3} =$

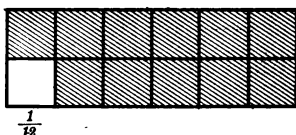
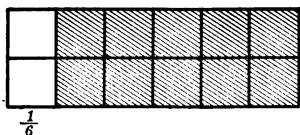
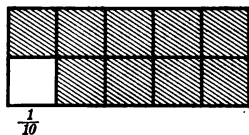
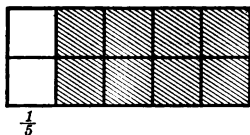
19.  $\frac{1}{3} \times 9\frac{1}{3} =$

Divide:

20.  $\frac{1}{2} \div 3 =$

21.  $\frac{1}{3} \div \frac{1}{12} =$

## LXXXIV. TENTHS




---

$\frac{1}{12}$  of a foot

---

$\frac{1}{6}$  of a foot

1.  $\frac{1}{5} + \frac{1}{10} = \frac{10}{10} + \frac{10}{10} = \frac{10}{10}$

2.  $\frac{1}{5} - \frac{1}{10} = \frac{10}{10} - \frac{10}{10} = \frac{10}{10}$

3.  $\frac{1}{6} + \frac{1}{12} = \frac{12}{12} + \frac{12}{12} = \frac{12}{12}$

7.  $\frac{3}{5} + \frac{1}{10} = \frac{(\quad) + (\quad)}{10} = \frac{10}{10}$

4.  $\frac{1}{6} - \frac{1}{12} = \frac{12}{12} - \frac{12}{12} = \frac{12}{12}$

5.  $\frac{2}{5} + \frac{1}{10} = \frac{(\quad) + (\quad)}{10} = \frac{10}{10} = 2$

6.  $\frac{2}{5} - \frac{1}{10} = \frac{(\quad) - (\quad)}{10} = \frac{10}{10}$

\* This means 9 times  $\frac{1}{3}$  plus  $\frac{1}{3}$  of  $\frac{1}{3}$ .

$$8. \frac{3}{5} - \frac{1}{10} = \frac{(\quad) - (\quad)}{10} = \frac{\quad}{10} = \text{---}.$$

$$9. \frac{5}{6} + \frac{1}{12} = \frac{(\quad) + (\quad)}{12} = \frac{\quad}{12}.$$

$$10. \frac{5}{6} - \frac{1}{12} = \frac{(\quad) - (\quad)}{12} = \frac{\quad}{12} = \text{---}.$$

11. A piece of wire was divided into two equal parts. One part was  $1\frac{1}{4}$  ft. long. The wire at first was — ft. long.

12. A string was  $1\frac{1}{4}$  ft. long. It was divided into two equal parts. Each part was — of a foot long.

DRILL

<i>Add:</i>	<i>Subtract:</i>	<i>Multiply:</i>	<i>Divide:</i>
13. $4\frac{1}{5}$ <u>  <math>2\frac{1}{10}</math>  </u>	15. $4\frac{1}{5}$ <u>  <math>2\frac{1}{10}</math>  </u>	17. $8\frac{2}{5}$ <u>      4      </u>	19. $2)\underline{189}$
14. $4\frac{1}{6}$ <u>  <math>3\frac{1}{12}</math>  </u>	16. $4\frac{1}{6}$ <u>  <math>3\frac{1}{12}</math>  </u>	18. $4\frac{5}{6}$ <u>      2      </u>	20. $3)\underline{196}$

21. Practice Example 15 in Lesson 81.

NOTE. — Require pupils to make the drawings.

LXXXV. MIXED NUMBERS

1. One line is  $1\frac{1}{3}$  ft. long; another is  $2\frac{1}{2}$  ft. long; the two together are — and — ft. long.  $1\frac{1}{3} + 2\frac{1}{2} =$

2. A line  $3\frac{1}{3}$  ft. long has a piece  $1\frac{1}{4}$  ft. long cut off. It is then only — and — ft. long.  $3\frac{1}{3} - 1\frac{1}{4} =$

3. Draw a square  $1\frac{1}{6}$  ft. long. The perimeter is — and — ft.  $1\frac{1}{6} \times 4 =$



**LXXXVI. MIXED NUMBERS (Continued)**

1. 2 hr. 10 min. + 3 hr. 12 min. =  $2\frac{1}{2} + 3\frac{1}{2} =$
2. 2 hr. 45 min. - 1 hr. 30 min. =  $2\frac{3}{4} - 1\frac{1}{2} =$
3. 3 hr. 15 min.  $\times 3 =$   $3\frac{1}{4} \times 3 =$
4. 4 hr. 4 min.  $\times 3\frac{1}{2} =$   $4\frac{1}{2} \times 2\frac{1}{2} =$
5. 4 hr. 4 min.  $\div 4$  min. =  $4\frac{1}{4} \div \frac{1}{4} =$
6. 24 min.  $\div 6 =$   $\frac{1}{2} \div 6 =$
7. \$2.10 + \$3.05 =  $2\frac{1}{10} + 3\frac{1}{5} =$
8. \$2.20 - \$1.10 =  $2\frac{1}{5} - 1\frac{1}{10} =$
9. \$4.25  $\times 4 =$   $4\frac{1}{4} \times 4 =$
10. \$6.9  $\div$  \$.3 = \*  $6\frac{9}{10} \div \frac{3}{10} = *$
11. \$6.9  $\div 3 = *$   $6\frac{9}{10} \div 3 = *$

12. It is now half-past 2 o'clock. In 35 minutes it will be — minutes after — o'clock.

13. From 3.45 to 4.15 it is — minutes.

14. From 9.30 to 10.40 it is — hour and — minutes.

15. From 7.40 to 9.50 it is — hours and — minutes.

16. Learn this :

Thirty days hath September,  
April, June, and November.

The other months have 31 days each, except February. In leap year, which occurs once every four years, February has 29 days; in other years, 28 days.

17. Practice Example 24 in Lesson 85.

\* In case of hesitation, have pupils tell the meaning.

**LXXXVII. MIXED NUMBERS (Continued)**

1. In 9 days there are — week and — days.
2. In 28 days there are — weeks.
3. In January there are — weeks and — days.
4. In February there are — weeks and — day.
5. In March there are — weeks and — days.
6. In April there are — weeks and — days.
7. In May there are — weeks and — days.
8. In June there are — weeks and — days.
9. 15 halves =                      15 sixths =
10. 35 thirds =                      17 eighths =
11. 37 fourths =                      14 ninths =
12. 26 fourths =                      17 tenths =
13. 26 fifths =                      12 elevenths =
14. 37 fifths =                      13 twelfths =

**DRILL***Subtract :*

- |  |  |   |
|--|--|---|
| 15. $15 \quad 14$<br>$\underline{2\frac{1}{3}} \quad \underline{3\frac{1}{2}}$ | 17. $9 \quad 17$<br>$\underline{3\frac{2}{3}} \quad \underline{8\frac{1}{5}}$  | 19. $16\frac{1}{2}$<br>$\underline{4\frac{1}{3}}$ |
| 16. $20 \quad 22$<br>$\underline{4\frac{1}{4}} \quad \underline{1\frac{1}{4}}$ | 18. $21 \quad 27$<br>$\underline{3\frac{2}{5}} \quad \underline{5\frac{3}{5}}$ | 20. $18\frac{1}{4}$<br>$\underline{5\frac{1}{8}}$ |

21. Practice Example 24 in Lesson 85.

## LXXXVIII. MIXED NUMBERS (Continued)

1. In July there are — weeks and — days.
2. In August there are — weeks and — days.
3. In September there are — weeks and — days.
4. In October there are — weeks and — days.
5. In November there are — weeks and — days.
6. In December there are — weeks and — days.
7. If pencils cost 10¢ each, for 63¢ I can buy — pencils and have —¢ left.
8. At 6¢ a quart, for 21¢ I can buy — and — — quarts of milk.
9. When books cost 12¢ each, for 39¢ I can buy — books and have —¢ left.
10. If 3 yd. of cloth will make a coat, how many coats can be made from 27 yd.?
11. At 8¢ apiece, — melons can be bought for 32¢.

## DRILL

*Add :*

$$\begin{array}{r} 12. \quad 14\frac{3}{4} \quad 6\frac{2}{3} \\ \quad \quad 2\frac{1}{2} \quad 5\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 15\frac{1}{4} \quad 9\frac{1}{3} \\ \quad \quad 5\frac{1}{8} \quad 3\frac{1}{9} \\ \hline \end{array}$$

*Subtract :*

$$\begin{array}{r} 14. \quad 12\frac{1}{2} \quad 15\frac{1}{3} \\ \quad \quad 6\frac{1}{4} \quad 8\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 14\frac{1}{5} \quad 11\frac{1}{3} \\ \quad \quad 7\frac{1}{10} \quad 3\frac{1}{9} \\ \hline \end{array}$$

*Multiply :*

$$\begin{array}{r} 16. \quad 14\frac{2}{5} \quad 16\frac{3}{4} \\ \quad \quad 3 \quad 5 \\ \hline \end{array}$$

$$\begin{array}{r} 17. \quad 9 \quad 12 \\ \quad \quad 3\frac{1}{3} \quad 4\frac{2}{3} \\ \hline \end{array}$$

*Divide :*

$$18. \quad 3 \overline{)181\frac{1}{2}} \quad 3 \overline{)241\frac{1}{3}} \quad 19. \quad 3 \overline{)151\frac{1}{4}} \quad 3 \overline{)271\frac{1}{2}} \quad 20. \quad 4 \overline{)189} \quad 5 \overline{)242}$$



**LXXXIX. TIME AND DATES**

1. The first day of September, 1903, was Tuesday. The second Tuesday was the —, the third Tuesday was the —, the fourth Tuesday was the —, and the fifth Tuesday was the —.

2. Wednesday was the 2d day of September, 1903. The second Wednesday was the —, the third Wednesday was the —, the fourth Wednesday was the —, and the fifth Wednesday was the —.

3. The 3d of September, 1903, was Friday. The other Fridays of that month were on the —, the —, and the —.

4. If the first day of February is Wednesday, what day is the last of the month in a common year? In a leap year?

5. If the 3d of March is Tuesday, the — is Tuesday, the — is Tuesday, the — is Tuesday, and the — is Tuesday.

6. One month after the 1st of January is the — of —.

7. One month after the fifth of February is the — of —.

8. One month after the 16th of March is the — of —.

9. Two months after the first of January is the — of —.

10. Two months after the fifth of February is the — of —.

## DRILL

*Add:*

$$\begin{array}{r} 11. \quad 2 \text{ hr. } 35 \text{ min.} \\ \quad \quad 3 \text{ hr. } 14 \text{ min.} \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 3 \text{ gal. } 1 \text{ qt.} \\ \quad \quad 2 \text{ gal. } 2 \text{ qt.} \\ \hline \end{array}$$

*Divide:*

$$15. \quad 6 \overline{)862}$$

$$16. \quad 7 \overline{)921}$$

$$17. \quad 7 \overline{)644}$$

$$18. \quad 7 \overline{)735}$$

$$\begin{array}{r} 13. \quad 2 \text{ bu. } 2 \text{ pk.} \\ \quad \quad 4 \text{ bu. } 1 \text{ pk.} \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 4 \text{ ft. } 4 \text{ in.} \\ \quad \quad 3 \text{ ft. } 3 \text{ in.} \\ \hline \end{array}$$

$$19. \quad 7 \overline{)814}$$

$$20. \quad 8 \overline{)328}$$

$$21. \quad 8 \overline{)352}$$

$$22. \quad 8 \overline{)456}$$

23. Try to add  
in 10 seconds:  
first down, then  
up.

8

8

8

8

8

8

8

8

8

7

6

5

4

## XC. TIME AND DATES (Continued)

1. From January 1st to February 1st it is ——— days.
2. From May 1st to June 1st it is ——— days.
3. From August 1st to September 1st it is ——— days.
4. From March 1st to April 1st it is ——— days.
5.  $2 \text{ bu. } 2 \text{ pk.} + 3 \text{ bu. } 1 \text{ pk.} = 2\frac{1}{2} + 3\frac{1}{4} =$
6.  $4 \text{ bu. } 2 \text{ pk.} - 2 \text{ bu. } 1 \text{ pk.} = 4\frac{1}{2} - 2\frac{1}{4} =$
7.  $4 \text{ bu. } 2 \text{ pk.} \times 3 = 4\frac{1}{2} \times 3 =$
8.  $4 \text{ bu. } 2 \text{ pk.} \times 2\frac{1}{2} = 4\frac{1}{2} \times 2\frac{1}{2} =$
9.  $4 \text{ bu. } 2 \text{ pk.} \div 2 \text{ pk.} = 4\frac{1}{2} \div \frac{1}{2} =$

## DRILL

*Find sums :*

$$\begin{array}{r} 10. \quad 87\frac{1}{4} \\ \quad 15\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad 69\frac{2}{5} \\ \quad 17\frac{1}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 4 \text{ bu. } 3 \text{ pk.} \\ \quad 2 \text{ bu. } 2 \text{ pk.} \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 8\frac{1}{8} \\ \quad 3.1 \\ \hline \end{array}$$

*Find differences :*

$$\begin{array}{r} 14. \quad 85\frac{1}{4} \\ \quad 15\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 69\frac{2}{5} \\ \quad 17\frac{1}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 16. \quad 5 \text{ bu. } 3 \text{ pk.} \\ \quad 2 \text{ bu. } 2 \text{ pk.} \\ \hline \end{array}$$

$$\begin{array}{r} 17. \quad 8\frac{1}{8} \\ \quad 3.1 \\ \hline \end{array}$$

*Find products :*

$$\begin{array}{r} 18. \quad 38\frac{4}{9} \\ \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} 19. \quad 56\frac{2}{5} \\ \quad 3 \\ \hline \end{array}$$

$$\begin{array}{r} 20. \quad 2 \text{ bu. } 1 \text{ pk.} \\ \quad 4 \\ \hline \end{array}$$

$$\begin{array}{r} 21. \quad 6.3 \\ \quad 6 \\ \hline \end{array}$$

*Find quotients :*

$$22. \quad 5 \text{ qt.}) \underline{375 \text{ qt.}}$$

$$23. \quad 7 \text{ tenths}) \underline{714 \text{ tenths}}$$

$$24. \quad .7) \underline{71.4}$$

$$25. \quad 7) \underline{71.4}$$

$$26. \quad 7) \underline{72.1}$$

27. Practice Example 23 in Lesson 89.

## XCI. GENERAL PRACTICE

1. A train ran 125 miles in 3 hours. It went at the rate of — miles an hour.

2. A boy rode his bicycle 42 miles in 4 hours. He rode at the rate of — miles an hour.

3. A man drove 3 hours at the rate of 6.4 miles an hour. He drove — miles.

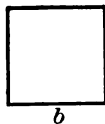
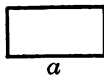
4. A man walked 4.2 miles in 1 hour and 3.3 miles the next hour. In both hours he walked — miles.

5. Two men start from the same place and walk in the same direction. One goes 5.8 miles and the other goes 4.5 miles. How far apart are they?

6. 5 weeks and 3 days are — days.  
 7. 3 feet and 3 inches are — inches.  
 8. 11 yards and 2 feet are — feet.  
 9. 8 gallons and 3 quarts are — quarts.  
 10.  $5\frac{4}{7} =$  — sevenths.      12.  $11\frac{1}{3} =$  — thirds.  
 11.  $3\frac{5}{12} =$  — twelfths.      13.  $8\frac{1}{4} =$  — fourths.  
 14.  $\frac{38}{7} =$       16.  $\frac{35}{8} =$       18.  $\frac{2}{9} \times 5 =$   
 15.  $\frac{34}{3} =$       17.  $\frac{5}{9} \times 3 =$       19.  $\frac{7}{9} \times 3 =$   
 20.  $\frac{4}{9} \times 3 =$       21. Practice Example 23 in Lesson 89.

## XCII. DENOMINATE NUMBERS. RATIO

1. Add 2 ft. 8 in. and 3 ft. 5 in.
2. Add 28 ft. 9 in. and 37 ft. 8 in.
3. To the difference of 9 and 3 add 4.
4. To the difference of 820 and 232 add 179.
5.  $\frac{3}{4}$  of 48 inches are — inches.
6.  $\frac{3}{4}$  of 968 inches are — inches.
7. 12 ft. are  $\frac{3}{4}$  of — feet.
8. 216 ft. are  $\frac{3}{4}$  of — ft.
9. The ratio of  $a$  to  $b$  is —.  $\frac{1}{2}$  is  
 the ratio of 4 to —.
10. The ratio of  $b$  to  $a$  is —. 2 is  
 the ratio of 6 to —.



11. The ratio of 8 to 24 is ——.  $\frac{1}{3}$  is the ratio of 6 to ——.
12. The ratio of 24 to 8 is ——. 3 is the ratio of 12 to ——.
13.  $\frac{2}{3}$  of 9 are  $\frac{1}{3}$  of ——.  $\frac{2}{3}$  of 9 are  $\frac{1}{2}$  of ——.
14.  $\frac{3}{4}$  of 12 are  $\frac{1}{4}$  of ——.  $\frac{3}{4}$  of 12 are  $\frac{1}{3}$  of ——.
15. Practice Example 23 in Lesson 89.

## DRILL

<i>Add:</i>	<i>Subtract:</i>	<i>Multiply:</i>	<i>Divide:</i>
16. $24\frac{7}{12}$ <u><math>16\frac{1}{4}</math></u>	19. $94\frac{3}{5}$ <u><math>15\frac{3}{10}</math></u>	22. 80 <u><math>4\frac{1}{5}</math></u>	25. $7 \overline{)126}$
17. $19\frac{1}{12}$ <u><math>25\frac{5}{6}</math></u>	20. $8\frac{2}{5}$ <u><math>1\frac{1}{10}</math></u>	23. 85 <u><math>5\frac{1}{5}</math></u>	26. $7 \overline{)928}$
18. $204\frac{1}{3}$ <u><math>199\frac{1}{4}</math></u>	21. 90 <u><math>4\frac{1}{3}</math></u>	24. 76 <u><math>5\frac{1}{4}</math></u>	27. $7 \overline{)840}$
			28. $8 \overline{)345}$
			29. $8 \overline{)578}$

## XCIII. FRACTIONS

---

 $\frac{1}{12}$  of a foot

---

 $\frac{1}{6}$  of a foot

1. One sixth of a foot and one twelfth of a foot are — twelfths of a foot.
2. One sixth of a foot less one twelfth of a foot is — twelfth of a foot.
3. Five twelfths of a foot and  $\frac{1}{6}$  of a foot are — twelfths of a foot.

$$4. \frac{5}{12} \text{ of a foot} + \frac{1}{6} \text{ of a foot} = \frac{5}{12} + \frac{1}{6} =$$

$$5. \frac{5}{12} \text{ of a foot} - \frac{1}{6} \text{ of a foot} = \frac{5}{12} - \frac{1}{6} =$$

$$6. \frac{5}{12} \text{ of a foot} \times 3 = \frac{5}{12} \times 3 =$$

$$7. \frac{5}{12} \text{ of a foot} \times 2\frac{1}{2} = * \quad \frac{5}{12} \times 2\frac{1}{2} = *$$

$$8. 3 \text{ feet} + \frac{1}{6} \text{ of a foot} = * \quad 3 + \frac{1}{6} = *$$

$$9. \frac{1}{6} \text{ of a foot} + 4 = * \quad \frac{1}{6} + 4 = *$$

10. A string  $3\frac{1}{3}$  feet long is divided into pieces  $\frac{1}{3}$  of a foot long. There are — pieces.

11. A string  $3\frac{1}{4}$  feet long is cut into 2 equal pieces. Each piece is — feet long.

12. The ratio of 6 to 12 is —. The ratio of 5 to 20 is —.

13.  $\frac{1}{3}$  is the ratio of 7 to —. The ratio of 15 to 5 is —.

14.  $\frac{2}{3}$  is the ratio of 8 to —. The ratio of 6 to 9 is —.

15. If 9 chairs cost \$25, 27 chairs will cost \$—.

16. If 5 sheep cost \$35, 20 sheep will cost \$—.

17. The ratio of 9 to 12 is — —. If 12 lambs cost \$16, 9 lambs will cost — — of \$16, or \$—.

18. Try to add this column in 10 seconds: first down, then up.

9

9

9

9

9

9

9

9

9

9

9

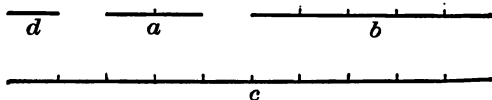
9

2

—

\* Require a statement of the meaning, if there is hesitation.

## XCIV. REVIEW



1.  $d$  is equal to — of  $c$ .  $b$  is equal to — of  $c$ .

2.  $\frac{1}{10} = \text{—}\%$ .

6.  $a = \text{—}\%$  of  $c$ .

3.  $\frac{1}{5} = \text{—}\%$ .

7.  $b = \text{—}\%$  of  $c$ .

4.  $\frac{1}{2} = \text{—}\%$ .

8. 50% of  $\frac{1}{2} =$

5.  $d = \text{—}\%$  of  $c$ .

9. 20% of 10 =

10. 10% of 30 =

11.  $d = 100\%$  of itself,  $a = \text{—}\%$  of  $d$ ,  $b = \text{—}\%$  of  $d$ , and  $c = \text{—}\%$  of  $d$ .

12.  $a = \text{—}$  times  $d$ ,  $b = \text{—}$  times  $d$ , and  $c = \text{—}$  times  $d$ .

13. 200% of 6 = — times 6, or —.

14. 500% of 4 = — times 4, or —.

15. 1000% of 2 = — times 2, or —.

16. 13 inches  $\div$  2 =

21.  $9\frac{1}{2}$  inches  $\div$  2 =

17. 15 feet  $\div$  2 =

22. 13 yards  $\div$  3 =

18. 19 inches  $\div$  3 =

23.  $13\frac{1}{2}$  yards  $\div$  3 =

19. 23 feet  $\div$  3 =

24. 17 yards  $\div$  3 =

20.  $8\frac{1}{2}$  inches  $\div$  2 =

25.  $17\frac{1}{2}$  yards  $\div$  3 =

26. Practice Example 17, Lesson 81.

## XCV. FRACTIONS

1. Halves can be changed to 4ths, to —, to —, to —, to —.

2. Thirds can be changed to 6ths, to —, to —, to —.

3. Fourths can be changed to 8ths, to —, to —, to —.

4. Fifths can be changed to 10ths, to —, to —, to —.

5. Sixths can be changed to 12ths, to —, to —, to —.

6. One half is — sixteenths.  $\frac{1}{2}$  is  $\frac{\quad}{20}$ .

7. One third is — eighteenths.  $\frac{1}{3}$  is  $\frac{\quad}{30}$ .

8. One fourth is — twenty-fourths.  $\frac{1}{4} = \frac{\quad}{28}$ .

9. One fifth is — twentieths.  $\frac{1}{5} = \frac{\quad}{25}$ .

10. $\frac{1}{2} + \frac{1}{4} =$	13. $\frac{1}{3} + \frac{1}{6} =$	9
$\frac{1}{2} - \frac{1}{4} =$	$\frac{1}{3} - \frac{1}{6} =$	9
$\frac{1}{2} \times 4 =$	$\frac{1}{3} \times 6 =$	9

11. $\frac{1}{2} + \frac{1}{6} =$	14. $\frac{1}{4} + \frac{1}{8} =$	9
$\frac{1}{2} - \frac{1}{6} =$	$\frac{1}{4} - \frac{1}{8} =$	9
$\frac{1}{2} \times 3 =$	$\frac{1}{4} \times 7 =$	8

12. $\frac{1}{2} + \frac{1}{8} =$	15. $\frac{1}{4} + \frac{1}{12} =$	7
$\frac{1}{2} - \frac{1}{8} =$	$\frac{1}{4} - \frac{1}{12} =$	6
$\frac{1}{2} \times 2 =$	$\frac{1}{4} \times 8 =$	5

16. Try to add this column in 10 seconds: first down, then up.



**XCVI. DIVIDING BY A FRACTION**

1. One half of  $\frac{1}{8}$  is ———.  $\frac{1}{2}$  of  $\frac{1}{10}$  is ———.
2. One half of  $\frac{1}{20}$  is ———.  $\frac{1}{2}$  of  $\frac{1}{30}$  is ———.
3. One half is contained in 3 ——— times.  $3 \div \frac{1}{2} =$
4.  $\frac{1}{2}$  is contained in 2 ——— times.  $2 \div \frac{1}{2} =$
5.  $\frac{1}{3}$  is contained in 3 ——— times.  $3 \div \frac{1}{3} =$
6.  $\frac{1}{4}$  is contained in 2 ——— times.  $2 \div \frac{1}{4} =$
7.  $\frac{1}{5}$  is contained in 2 ——— times.  $2 \div \frac{1}{5} =$
8.  $\frac{1}{6}$  is contained in 2 ——— times.  $2 \div \frac{1}{6} =$
9.  $\frac{1}{7}$  is contained in 2 ——— times.  $2 \div \frac{1}{7} =$
10.  $\frac{1}{8}$  is contained in 2 ——— times.  $2 \div \frac{1}{8} =$
11.  $1\frac{1}{3} \div \frac{1}{3} =$        $1\frac{2}{3} \div \frac{1}{3} =$        $2\frac{1}{3} \div \frac{1}{3} =$        $2\frac{2}{3} \div \frac{1}{3} =$
12.  $1\frac{1}{4} \div \frac{1}{4} =$        $1\frac{3}{4} \div \frac{1}{4} =$        $2\frac{1}{4} \div \frac{1}{4} =$        $2\frac{3}{4} \div \frac{1}{4} =$
13.  $1\frac{1}{5} \div \frac{1}{5} =$        $1\frac{2}{5} \div \frac{1}{5} =$        $2\frac{1}{5} \div \frac{1}{5} =$        $2\frac{2}{5} \div \frac{1}{5} =$
14.  $1\frac{1}{6} \div \frac{1}{6} =$        $1\frac{5}{6} \div \frac{1}{6} =$        $2\frac{1}{6} \div \frac{1}{6} =$        $2\frac{5}{6} \div \frac{1}{6} =$
15.  $\frac{2}{3} \div \frac{1}{6} =$        $\frac{2}{3} - \frac{1}{6} =$        $\frac{2}{3} \times 3 =$        $\frac{2}{3} \times 4 =$
16.  $\frac{3}{4} \div \frac{1}{8} =$        $\frac{3}{4} - \frac{1}{8} =$        $\frac{3}{4} \times 4 =$        $\frac{3}{4} \times 3 =$
17.  $\frac{2}{3} \div \frac{1}{9} =$        $\frac{2}{3} - \frac{1}{9} =$        $\frac{2}{3} \times 5 =$        $\frac{2}{3} \times 6 =$
18. Practice Example 16 in Lesson 95.

**DRILL**

19.  $2 \div \frac{1}{2} =$        $3\frac{1}{2} \div \frac{1}{2} =$        $4\frac{1}{2} \div \frac{1}{2} =$        $5\frac{1}{2} \div \frac{1}{2} =$
20.  $2 \div \frac{1}{3} =$        $3 \div \frac{1}{3} =$        $4 \div \frac{1}{3} =$        $5 \div \frac{1}{3} =$
21.  $2 \div \frac{1}{4} =$        $3 \div \frac{1}{4} =$        $4 \div \frac{1}{4} =$        $5 \div \frac{1}{4} =$
22.  $2 \div \frac{1}{5} =$        $3 \div \frac{1}{5} =$        $4 \div \frac{1}{5} =$        $5 \div \frac{1}{5} =$

## XCVII. REVIEW

1.  $3 \div \frac{1}{2}$  means, find how many times  $\frac{1}{2}$  is contained in 3.  $\frac{1}{2}$  is contained —.
2.  $\frac{1}{2} \div 3$  means, find  $\frac{1}{3}$  of  $\frac{1}{2}$ .  $\frac{1}{3}$  of —.
3.  $4 \div \frac{1}{2}$  means, —. —.
4.  $\frac{1}{2} \div 4$  means, —. —.
5.  $5 \div \frac{1}{2}$  means, —. —.
6.  $\frac{1}{2} \div 5$  means, —. —.
7.  $2 \div \frac{1}{3}$  means, —. —.
8.  $\frac{1}{3} \div 2$  means, —. —.
9.  $\frac{2}{5} + \frac{1}{10} =$        $\frac{2}{5} - \frac{1}{10} =$        $\frac{2}{5} \times 3 =$        $\frac{2}{5} \times 7 =$
10.  $\frac{4}{5} + \frac{3}{10} =$        $\frac{4}{5} - \frac{3}{10} =$        $\frac{4}{5} \times 4 =$        $\frac{4}{5} \times 5 =$
11.  $\frac{1}{4} + \frac{1}{3} =$  (Change to 12ths.)\*
12.  $\frac{1}{3} - \frac{1}{4} =$  (Change to —.)
13.  $\frac{1}{2} + \frac{1}{3} =$     14.  $\frac{1}{2} - \frac{1}{3} =$     15.  $\frac{2}{3} + \frac{1}{2} =$     16.  $\frac{2}{3} - \frac{1}{2} =$
17. Practice Example 16 in Lesson 95.

## XCVIII. FRACTIONS. RATIO AND PERCENTAGE

1. Add  $\frac{1}{4}$  and  $\frac{1}{5}$ . (Change to —.)
2. Add  $\frac{1}{2}$  and  $\frac{1}{7}$ . (Change to —.)
3. Add  $\frac{1}{3}$  and  $\frac{1}{5}$ . (Change to —.)
4. Add  $\frac{3}{4}$  and  $\frac{1}{5}$ . (Change to —.)
5. From  $\frac{1}{2}$  take  $\frac{1}{7}$ . From  $\frac{2}{3}$  take  $\frac{2}{5}$ .

\* Teach pupils to say:  $\frac{1}{4} = \frac{3}{12}$ ,  $\frac{1}{3} = \frac{4}{12}$ ;  $\frac{3}{12}$  and  $\frac{4}{12}$  are  $\frac{7}{12}$ .

6. From  $\frac{1}{2}$  take  $\frac{1}{20}$ . From  $\frac{1}{2}$  take  $\frac{2}{7}$ .
7. 3 is ——— of 15. 3 is ———% of 15.
8. 6 is ——— of 30. 6 is ———% of 30.
9. 14 is ——— of 28. 14 is ———% of 28.
10. 5 is ——— of 20. 5 is ———% of 20.
11. 6 is ——— of 18. 6 is ———% of 18.
12. 7 is ——— of 21. 7 is ———% of 21.
13. 2 is ——— of 12. 2 is ———% of 12.
14. 4 is ——— of 24. 4 is ———% of 24.
15. 3 is ——— of 30. 3 is ———% of 30.
16. 5 is ——— of 50. 5 is ———% of 50.
17. 20% of 15 pounds = ——— of 15 pounds, or ——— pounds.
18. 50% of 28 years = ——— of 28 years, or ——— years.
19. 25% of 32 days = ——— of 32 days, or ——— days.
20.  $33\frac{1}{3}\%$  of 18 hours = ——— of 18 hours, or ——— hours.
21.  $16\frac{2}{3}\%$  of 24 minutes = ——— of 24 minutes, or ——— minutes.
22. 10% of 40 dollars = ——— of \$40, or \$——.
23. Try to add this column in 10 seconds: first down, then up.

9  
9  
9  
9  
9  
9  
9  
1  
3  
4  
2  
5  
6

## DRILL

24.  $6\frac{1}{2} \times 2 =$

29.  $13\frac{1}{2} + 2 =$

25.  $6\frac{1}{2} \div 2 =$

30.  $19\frac{1}{2} + 3 =$

26.  $4\frac{1}{3} + 3 =$

31.  $25\frac{1}{2} + 3 =$

27.  $6\frac{1}{4} + 3 =$

32.  $4 + \frac{1}{8} =$

28.  $6\frac{1}{5} \div 2 =$

33.  $6 + \frac{1}{6} =$

## XCIX. APPLICATIONS

1. Multiply  $\frac{2}{5}$  by 9.  $\frac{2}{3}$  by 10.  $\frac{2}{5}$  by  $6\frac{1}{2}$ .
2. Multiply  $4\frac{2}{3}$  by 8.  $\frac{4}{5}$  by 8.  $\frac{2}{5}$  by  $5\frac{1}{2}$ .
3. Multiply  $5\frac{3}{4}$  by 6.  $\frac{3}{5}$  by 10.  $\frac{2}{5}$  by 30.
4. Multiply  $6\frac{3}{5}$  by 5.  $\frac{4}{5}$  by 11.  $\frac{3}{5}$  by 20.
5. A merchant having \$60 lost 20% of it. His loss was \$——.
6. 6 hours are 20% of —— hours.
7. 5 men are 25% of —— men.
8. A certain school had 40 pupils, another school had 25% as many. The second school had —— pupils.
9. A boy having 40 marbles found 10% as many. He found —— marbles.
10. 7¢ are 10% of —— ¢.
11. I have a dozen pencils. Mary has  $33\frac{1}{3}\%$  as many. She has —— pencils.
12. James has 5 apples, but that number is only  $33\frac{1}{3}\%$  of the number of apples which John has. John has —— apples.

13.  $16\frac{2}{3}\%$  of \$96 is ——— dollars.  
 14. 7 books are  $16\frac{2}{3}\%$  of ——— books.  
 15. Add 20% of 10 and  $33\frac{1}{3}\%$  of 9.  
 16. 2 is 50% of ———.                      18. 5 is  $16\frac{2}{3}\%$  of ———.  
 17. 3 is 25% of ———.                      19. 6 is  $33\frac{1}{3}\%$  of ———.

### C. DIVIDING ONE FRACTION BY ANOTHER

1. Divide 3 fourths by 1 sixth.  
     3 fourths are ——— twelfths.  
     1 sixth is ——— twelfths.  
     —— twelfths are contained in ——— twelfths ——— and  
     —— ——— times.  
 (2 pencils are contained in 9 pencils 4 and one half times.  
 2 twelfths are contained in 9 twelfths 4 and one half times.)
2. Divide 3 fourths by 1 fifth.  
     3 fourths are ——— twentieths.  
     1 fifth is ——— twentieths.  
     —— twentieths in ——— twentieths ——— and ——— ———  
     times.
3. Divide 1 third by 1 fifth.  
     1 third is ——— fifteenths.  
     1 fifth is ——— fifteenths.  
     —— fifteenths in ——— fifteenths ——— and ——— ———  
     times.
4. Divide 2 thirds by 1 fourth.  
     2 thirds are ——— twelfths.  
     1 fourth is ——— twelfths.  
     —— twelfths in ——— twelfths ——— and ——— ——— times.

5. Divide  $\frac{1}{2}$  by  $\frac{1}{5}$ . (Change to 10ths.)

6. Divide  $\frac{3}{4}$  by  $\frac{1}{3}$ . (Change to —.)

7. Divide  $\frac{3}{5}$  by  $\frac{1}{10}$ .

8.  $\frac{1}{4} \div \frac{1}{12} = \frac{1}{12}$  of a foot is contained in  $\frac{1}{4}$  of a foot  
— times.

9.  $\frac{4}{5} \div \frac{1}{10} = \frac{1}{10}$  of a dollar is contained in  $\frac{4}{5}$  of a dollar  
— times.

10.  $\frac{1}{2} \div \frac{1}{8} = \frac{1}{8}$  of a pound is contained in  $\frac{1}{2}$  of a pound  
— times.

11.  $\frac{1}{4} \div \frac{1}{8} = \frac{1}{8}$  of a pound is contained in  $\frac{1}{4}$  of a pound  
— times.

12. Practice Example 23 in Lesson 98.

### CI. FRACTIONS. REDUCTION

1. Add  $\frac{1}{4}$  and  $\frac{1}{5}$ . Add  $\frac{3}{4}$  and  $\frac{1}{5}$ .

2. From  $\frac{1}{4}$  subtract  $\frac{1}{5}$ . From  $\frac{3}{4}$  subtract  $\frac{1}{5}$ .

3. Divide  $\frac{1}{4}$  by  $\frac{1}{5}$ . Divide  $\frac{3}{4}$  by  $\frac{1}{5}$ .

4. 65 inches are — feet and — inches.

5. 31 quarts are — gallons and — quarts.

6. 6 ft. 7 in. = — inches.

7. 9 gal. 3 qt. = — quarts.

8.  $5\frac{3}{7} =$  — sevenths.  $\frac{45}{7} =$  —.

9.  $6\frac{7}{8} =$  — eighths.  $\frac{70}{8} =$  —.

10.  $4\frac{7}{9} =$  — ninths.  $\frac{58}{9} =$  —.

11.  $\frac{39}{7} =$  —.  $4\frac{4}{7} =$  — sevenths.

## DRILL

*Add :*

$$\begin{array}{r} 12. \quad 88\frac{1}{3} \\ \quad 15\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 27\frac{1}{8} \\ \quad 15\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 38.7 \\ \quad 15.8 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 8 \text{ ft.} \quad 9 \text{ in.} \\ \quad 5 \text{ ft.} \quad 4 \text{ in.} \\ \hline \end{array}$$

*Subtract :*

$$\begin{array}{r} 16. \quad 43\frac{1}{5} \\ \quad 11\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 17. \quad 69\frac{1}{3} \\ \quad 14\frac{2}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 18. \quad 17.4 \\ \quad 2.8 \\ \hline \end{array}$$

$$\begin{array}{r} 19. \quad 6 \text{ yd.} \quad 2 \text{ ft.} \\ \quad 2 \text{ yd.} \quad 1 \text{ ft.} \\ \hline \end{array}$$

*Multiply :*

$$\begin{array}{r} 20. \quad 16\frac{1}{2} \\ \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 21. \quad 28\frac{2}{3} \\ \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 22. \quad 39.4 \\ \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 23. \quad 5 \text{ ft.} \quad 9 \text{ in.} \\ \quad 7 \\ \hline \end{array}$$

*Divide :*

$$24. \quad 8 \text{ lb.}) \underline{225 \text{ lb.}}$$

$$26. \quad 8) \underline{225 \text{ tenths}}$$

$$25. \quad 8 \text{ tenths}) \underline{735 \text{ tenths}}$$

$$27. \quad 8) \underline{22.5}$$

## CII. DENOMINATE NUMBERS. PERCENTAGE

1. In 1 rod there are — feet. (See Lesson 81.)
2. In 1 rod there are — yards.
3. Find the area of a rectangle 3 rods long and 2 rods wide.
4. The perimeter of this rectangle is — rods.
5. The perimeter of this rectangle is — feet.
6. The perimeter of this rectangle is — yards.
7. A mile is 320 rods. 2 miles are — rods.

8. Half a mile is — rods.
9. One fourth of a mile is — rods.
10. 50% of a mile is — rods.
11. 25% of a mile is — rods.
12. 20% of a mile is — rods.
13. 10% of a mile is — rods.
14. — inches are 1 foot,  
— feet are 1 yard,  
— yards are 1 rod,  
or — feet are 1 rod,  
— rods are 1 mile.
15. 7 ft. 9 in. = — inches.
16. 91 inches = — ft. and — inches.
17. 8 yd. 2 ft. = — inches.
18. 37 ft. = — yd. — ft.

# DRILL

*Multiply :*

- |                            |                     |
|----------------------------|---------------------|
| 19. 45                     | 23. $87\frac{1}{4}$ |
| $\underline{3\frac{1}{8}}$ | $\underline{9}$     |
| 20. 96                     | 24. $75\frac{1}{8}$ |
| $\underline{9\frac{1}{4}}$ | $\underline{8}$     |
| 21. 65                     | 25. $69\frac{1}{4}$ |
| $\underline{3\frac{1}{8}}$ | $\underline{9}$     |
| 22. 78                     | 26. $68\frac{1}{8}$ |
| $\underline{9\frac{1}{4}}$ | $\underline{8}$     |

*Divide :*

- |                         |                                   |
|-------------------------|-----------------------------------|
| 27. $9 \overline{)674}$ | 33. $3 \overline{)43\frac{1}{2}}$ |
| 28. $9 \overline{)846}$ | 34. $3 \overline{)52\frac{1}{2}}$ |
| 29. $9 \overline{)728}$ | 35. $4 \overline{)65\frac{1}{2}}$ |
| 30. $9 \overline{)367}$ | 36. $4 \overline{)73\frac{1}{2}}$ |
| 31. $9 \overline{)452}$ | 37. $4 \overline{)67\frac{1}{2}}$ |
| 32. $8 \overline{)296}$ | 38. $4 \overline{)89\frac{1}{2}}$ |



**CIII. MULTIPLYING BY 10, 20, 30, ETC.**

1. Multiply 7, 3, 6, 12, 11, 4, 6, 5, 8, 9, 10, each by 10.
2. Each number is multiplied by 10 by annexing a cipher.
3. Multiply 9, 43, 72, 63, 91, each by 10.
4. Multiply 13 by 20.

Write the 20 so that the 2 comes beneath the 3, allowing the cipher to come to the right.

$$\begin{array}{r} 13 \\ 20 \\ \hline 260 \end{array}$$

2 times 13 are 26; annex the cipher, and we have 260.

*Multiply :*

$$\begin{array}{r} 5. \quad 27 \quad 13 \quad 14 \quad 24 \quad 34 \quad 33 \quad 36 \quad 25 \quad 25 \\ \quad \quad 30 \quad 50 \quad 40 \quad 40 \quad 20 \quad 30 \quad 20 \quad 30 \quad 40 \end{array}$$

6. Multiply 26 by 13.

26 13 equals 10 and 3. 13 times 26 equal 10 times  
 13 26 and 3 times 26.  
 $\begin{array}{r} 26 \\ 13 \\ \hline 78 \end{array}$  3 times 26.  
 260 \* 10 times 26.  
 $\begin{array}{r} 260 \\ 338 \end{array}$

7. Multiply 26 by 14.

$$\begin{array}{r} 26 \quad 14 = 10 \text{ and } 4. \\ \quad 14 \\ \hline 104 \quad 4 \times 26. \\ 260 \quad 10 \times 26. \\ \hline 364 \end{array}$$

\* In practice the cipher is omitted in the partial product.

*Multiply :*

8. 32 <u>13</u>	11. 35 <u>14</u>	14. 48 <u>15</u>	17. 21 <u>17</u>	20. 29 <u>18</u>
9. 28 <u>13</u>	12. 46 <u>14</u>	15. 49 <u>16</u>	18. 29 <u>17</u>	21. 29 <u>19</u>
10. 33 <u>14</u>	13. 47 <u>15</u>	16. 52 <u>16</u>	19. 65 <u>13</u>	22. 74 <u>14</u>

**CIV. APPLICATIONS**

- Find the cost of 17 cows at 35 dollars apiece.
- How many trees in an orchard containing 13 rows, with 28 trees in each row?
- Find the cost of 5 boxes of butter, each containing 5 pounds, at 28¢ a pound.
- A man earns \$19.50 a week and spends \$14.25 a week. How much does he save in 2 weeks?
- A farmer sends 14 loads of grain, each containing 58 bushels, to market. He sent — bushels in all.
- Find the amount of this bill :
 

5 lb. of butter at 28¢ a pound.  
 3 dozen eggs at 26¢ a dozen.  
 4 boxes of currants at 16¢ a box.
- If I pay a bill of \$6.28 with a \$10 bill, what change should I receive?

8. Find my change, if I pay the following bill with a 20-dollar bill:

18 pounds of meat at 26¢.

4 pairs of shoes at \$3½.

9. How much change should I receive, if I pay the following account with 4 5-dollar bills?

5 algebras at \$.90.

4 histories at \$1.20.

7 arithmetics at \$1.24.

### DRILL

*Multiply :*

$$\begin{array}{r} 10. \quad 21 \text{ books} \\ \quad \underline{23} \end{array}$$

$$\begin{array}{r} 13. \quad 26¢ \\ \quad \underline{26} \end{array}$$

$$\begin{array}{r} 16. \quad 28 \text{ boxes} \\ \quad \underline{29} \end{array}$$

$$\begin{array}{r} 11. \quad \$24 \\ \quad \underline{24} \end{array}$$

$$\begin{array}{r} 14. \quad 29 \text{ pencils} \\ \quad \underline{27} \end{array}$$

$$\begin{array}{r} 17. \quad 27 \text{ erasers} \\ \quad \underline{28} \end{array}$$

$$\begin{array}{r} 12. \quad 25 \text{ pounds} \\ \quad \underline{25} \end{array}$$

$$\begin{array}{r} 15. \quad 27¢ \\ \quad \underline{27} \end{array}$$

$$\begin{array}{r} 18. \quad 19 \text{ quarts} \\ \quad \underline{19} \end{array}$$

*Divide :*

$$19. \quad 6 \overline{)552}$$

$$26. \quad 7 \overline{)966}$$

$$33. \quad 8 \overline{)454}$$

$$40. \quad 9 \overline{)538}$$

$$20. \quad 2 \overline{)473}$$

$$27. \quad 4 \overline{)104}$$

$$34. \quad 6 \overline{)734}$$

$$41. \quad 8 \overline{)184}$$

$$21. \quad 2 \overline{)507}$$

$$28. \quad 4 \overline{)605}$$

$$35. \quad 6 \overline{)545}$$

$$42. \quad 8 \overline{)296}$$

$$22. \quad 2 \overline{)199}$$

$$29. \quad 4 \overline{)673}$$

$$36. \quad 6 \overline{)702}$$

$$43. \quad 8 \overline{)976}$$

$$23. \quad 3 \overline{)171}$$

$$30. \quad 5 \overline{)890\frac{1}{2}}$$

$$37. \quad 7 \overline{)154}$$

$$44. \quad 9 \overline{)837}$$

$$24. \quad 3 \overline{)291}$$

$$31. \quad 5 \overline{)675\frac{1}{2}}$$

$$38. \quad 7 \overline{)238}$$

$$45. \quad 9 \overline{)747}$$

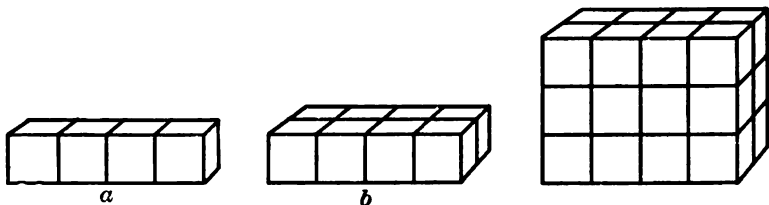
$$25. \quad 3 \overline{)566}$$

$$32. \quad 5 \overline{)435\frac{1}{2}}$$

$$39. \quad 7 \overline{)658}$$

$$46. \quad 9 \overline{)765}$$

## CV. RECTANGULAR SOLIDS



1. With 4 1-inch cubes form a rectangular solid 4 by 1 by 1, as shown in *a*.

2. With 4 more 1-inch cubes placed by the side of the first four cubes, form a rectangular solid 4 by 2 by 1, as shown in *b*.

3. Upon this solid form another of the same size.

4. In these two layers you have used — cubes.

5. Upon the second layer, form another of the same size as each.

6. You have now — layers, having — cubic inches in each layer.

7. In all you have used — cubes.  $4 \text{ cubes} \times 2 \times 3 =$  — cubes.

8. In a rectangular solid 2 in. by 4 in. by 4 in. there are — cubic inches.

9. In a rectangular solid 3 in. by 4 in. by 5 in. there are — cubic inches.

How many cubic inches in a rectangular solid :

10. 3 in. by 5 in. by 6 in.?

11. 4 in. by 6 in. by 8 in.?

12. 7 in. by 8 in. by 9 in.?

13. A rectangular solid has — faces, or rectangular surfaces.

14. Find the surface of one face of a 2-inch cube.

15. Find the entire surface of a 2-inch cube.

16. How many cubic inches in a 2-inch cube?

17. How many cubic feet in a rectangular solid 2 ft. by 3 ft. by 6 ft.? These — cubic feet are called the volume of the solid.

Find the volume of a rectangular solid :

18. 4 ft. by 8 ft. by 9 ft.

19. 7 yd. by 3 yd. by 5 yd.

20. 5 in. by 6 in. by 12 in.

#### DRILL

21. Multiply 33 by 20.

25.  $13 \times 13 =$

22. Multiply 28 by 30.

26.  $24 \times 17 =$

23. Multiply 27 by 24.

27.  $24 \times 19 =$

24. Multiply 16 by 15.

28.  $25 \times 23 =$

#### CVI. TENTHS

1. 4 dimes + 2 dimes = — dimes.

2.  $.4 + .2 =$  — tenths.

3. 4 dimes - 2 dimes = — dimes.

4.  $.4 - .2 =$  — tenths.

5. 3 dimes  $\times$  2 means —. 2 times —.

6.  $.3 \times 2$  means ——. 2 times  $.3$  are — tenths.
7. 4 dimes  $\div$  2 dimes means, find ——. 2 dimes are con—— times.
8.  $.4 \div .2$  means, find ——.  $.2$  are con—— times.
9. 4 dimes  $\div$  2 means, find ——.  $\frac{1}{2}$  of 4 dimes is — dimes.
10.  $.4 \div 2$  means, find ——.  $\frac{1}{2}$  of  $.4$  is tenths.
11. 1 tenth of a dollar is — cents.  $\$.3 =$  — cents.
12. 6 tenths of a dollar are — cents.  $\$.6 =$  — cents.
13. 7 tenths of a dollar are — cents.  $\$.8 =$  — cents.
14. 40 cents = — tenths of a dollar, or — dimes.
15. 50 cents = — tenths of a dollar, or — dimes.
16.  $\$1.3 =$  — dollars and — dimes.  $\$2.5 =$
17.  $\$3.5 =$  — dollars and — dimes.  $\$4.6 =$
18.  $\$2.3 =$  — dollars and — cents.  $\$3.4 =$
19.  $\$4.2 + \$3.1 =$
20.  $\$3.4 + \$1.3 =$
21.  $\$5.1 + \$3.3 =$
22.  $\$6.4 - \$2.2 =$
23.  $\$5.6 - \$3.1 =$
24.  $\$1.3 \times 3 =$
25.  $\$2.4 \times 2 =$
26.  $\$2.4 \div \$.2 =$
27.  $\$2.4 \div 2 =$
28.  $\$6.9 \div 3 =$

## DRILL

*Add:**Subtract:*

$$\begin{array}{r} 29. \$4.3 \\ 7.2 \\ \hline 5.7 \end{array}$$

$$\begin{array}{r} 30. \$6.5 \\ 8.3 \\ \hline 7.8 \end{array}$$

$$\begin{array}{r} 31. 9.4 \text{ qt.} \\ 3.8 \text{ qt.} \\ \hline \end{array}$$

$$\begin{array}{r} 32. 8.3 \text{ qt.} \\ 5.4 \text{ qt.} \\ \hline \end{array}$$

## CVII. TENTHS (Continued)

1. The sum of 5.2 quarts and 3.4 quarts is —— quarts.
2. The difference of 5.8 quarts and 3.4 quarts is —— quarts.
3. The product of 3.2 quarts and 2 is —— quarts.
4. The quotient of 3.2 quarts divided by .4 quart is ——.
5. The quotient of 3.2 quarts divided by 4 is —— of a quart.

6.  $12.6 + 3.2 =$        $15.4 + 5.5 =$

7.  $8.7 - 4.6 =$        $20.3 - 8.2 =$

8.  $6.2 \times 3 =$        $5.3 \times 4 =$

9.  $6.2 \div .2 =$        $8.4 \div 4 =$

10.  $8.6 \div 2 =$        $6.9 \div 3 =$

11.  $12 \times .2$  means  $\frac{2}{10}$  of 12.  $\frac{2}{10}$  of 12 = 2 times  $\frac{1}{10}$  of 12.  
 $\frac{1}{10}$  of 12 = 1.2. 2 times 1.2 are 2.4.

12.  $13 \times .2 =$       15.  $2.3 + 4.2 =$       18.  $2.4 \div .2 =$

13.  $14 \times .2 =$       16.  $5.6 - 2.1 =$       19.  $2.4 \div 2 =$

14.  $15 \times .3 =$       17.  $2.4 \times 2 =$       20.  $24 \times .2 =$

## DRILL

*Add:*

21.  $\begin{array}{r} 8.4 \\ 2.3 \\ \hline \end{array}$

22.  $\begin{array}{r} 7.8 \\ .4 \\ \hline \end{array}$

23.  $\begin{array}{r} 9.7 \\ 8.8 \\ \hline \end{array}$

24.  $\begin{array}{r} 9.4 \\ 7 \\ \hline \end{array}$

$\underline{6.9}$

$\underline{6.9}$

$\underline{7.6}$

$\underline{8.6}$

*Subtract :*

$$\begin{array}{r} 25. \ 8.4 \\ \underline{7.9} \end{array}$$

$$\begin{array}{r} 26. \ 8 \\ \underline{2.8} \end{array}$$

$$\begin{array}{r} 27. \ 9 \\ \underline{3.7} \end{array}$$

$$\begin{array}{r} 28. \ 76 \\ \underline{2.4} \end{array}$$

*Multiply :*

$$\begin{array}{r} 29. \ 8.7 \\ \underline{9} \end{array}$$

$$\begin{array}{r} 30. \ 8.7 \\ \underline{23} \end{array}$$

$$\begin{array}{r} 31. \ 84 \\ \underline{.3} \end{array}$$

$$\begin{array}{r} 32. \ 96 \\ \underline{2.3} \end{array}$$

*Divide :*

$$33. \ 8.6 \text{ by } 2.$$

$$34. \ 8.6 \text{ by } .2.$$

$$35. \ 9.6 \text{ by } 4.$$

**CVIII. HUNDREDTHS**

1. In one dollar there are — cents. Each cent is — hundredth of a dollar.

2. We have learned that one cent may be written thus: \$.01.

3. A dime is one tenth of a dollar and may be written thus: \$.1.

4. Write eight dollars and twenty-five cents.

5. \$9.63 may be read thus: 9 dollars, 6 dimes, and 3 cents.

6. \$9.63 may be read thus: 9 dollars and 63 cents.

7. \$9.63 may be read thus: 9 and  $\frac{63}{100}$  dollars.

8. \$9.63 may be read thus: 9 hundred sixty-three hundredth-dollars.

Read all four ways each of the following:

9. \$7.28; \$3.49; \$8.65; \$5.47; \$6.72; \$4.75.



10. A farmer paid \$4.84 for a dog and \$3.05 for a dog house. For both he paid —.

11. From \$5 I paid 75 cents, and had \$ — and — cents left.

12. Add three dollars and seventy-four cents, eight dollars, and twenty-two dollars and seventeen cents.

13. From forty-nine dollars and fifty cents subtract twenty-eight dollars and thirty-four cents.

14. Add \$3.78, \$28, \$9.47, and \$69.

15. Find the sum of 9.24 and 3.02.

16. Find the difference of 9.24 and 3.02.

17. Find the product of 9.24 and 2.

18. Find the quotient of 9.24 divided by .02. (2 hundredths in 924 hundredths — times.)

19. Find the quotient of 9.24 divided by 2. (Give meaning.)

20. 28 tenth-dollars = — and — tenths dollars.

21. 2 and 8 tenths dollars = — tenth-dollars.

22. 328 hundredth-dollars = — and — hundredths dollars.

23. 3 and 28 hundredths dollars = — hundredth-dollars.\*

24. Find the quotient of \$8.42 divided by \$.02.

25. Find the quotient of \$8.4 divided by \$.2.

26. Find the quotient of \$.96 divided by \$.04.

\* 328 hundredth-dollars = 328 hundredths of a dollar.

## CIX. TENTHS

(2.4 should suggest 24 tenths clearly to the pupil.)

1. One third of 2.4 is ——. 2.4 are  $\frac{1}{2}$  of ——.
2. Two thirds of 2.4 are ——. 2.4 are  $\frac{2}{3}$  of ——.
3. One fourth of 2.4 is ——. 2.4 are  $\frac{1}{4}$  of ——.
4. Three fourths of 2.4 are ——. 2.4 are  $\frac{3}{4}$  of ——.
5. One tenth of 30 is ——. .2 of 30 are ——.
6. One tenth of 40 is ——. .2 of 40 are ——.
7. One tenth of 70 is ——. .3 of 70 are ——.
8. Three tenths of 40 are ——. .4 of 40 are ——.
9. Three tenths of 60 are ——. .3 of 80 are ——.
10. .1 of 16 is —— and —— tenths. .2 of 16 =
11. .1 of 28 is —— and —— tenths. .2 of 16 =
12. .1 of 45 is —— and —— tenths. .3 of 45 =
13. .1 of 27 = .2 of 27 = .3 of 27 =
14. .1 of 21 = .2 of 21 = .3 of 21 =
15. .1 of 32 = .2 of 32 = .3 of 32 =
16. Find .1 of 240.
17. Find .1 of 364.
18. Find .2 of 240.
19. Find .3 of 364.
20. Find .4 of 235.
21. Find .5 of 325.
22. Divide \$38.2 by \$.2.
23. Divide \$38.2 by .2.
24. Divide \$6.4 by \$.4.
25. Divide \$6.4 by 4.
26. Divide \$63.2 by \$.4.
27. Divide \$63.2 by 4.

**CX. NUMBERS OF SIX FIGURES**

1. We have learned that 10 hundreds are one thousand (1,000).
2. Write 2 thousand in figures. Write 3 thousand, 4 thousand, 25 thousand, 38 thousand.
3. 6,548 is read, 6 thousand 5 hundred 48.
4. 7,803 is read, 7 thousand 8 hundred 3.
5. Read 5,294; 6,049; 8,465; 9,005. 4,034 is read, 4 thousand 34.

*Write:*

6. Three hundred forty-nine.
7. 2 thousand 5 hundred 86.
8. 53 thousand 8 hundred 4.
9. One hundred 7.
10. Sixty-three thousand nine hundred seventy-four.
11. The ratio of 8 to 32 is ———.
12. The ratio of 9 to 45 is ———.
13. The ratio of 28 to 4 is ———.
14. The ratio of 40 to 5 is ———.
15. If 32 horses cost \$1920, 8 horses will cost ———.
16. If 45 pounds of sugar cost \$2.50, 9 pounds will cost ———¢.
17. If 4 gallons of oil cost 62¢, 28 gallons will cost ———.
18. If 5 books cost \$12.50, 40 books will cost \$ ———.

## CXI. LONG DIVISION

$$\begin{array}{r}
 \$1955 \\
 1. \quad 3 \overline{) \$5865} \\
 \underline{3} \\
 28 \\
 \underline{27} \\
 16 \\
 \underline{15} \\
 15 \\
 \underline{15}
 \end{array}$$

$$\begin{array}{r}
 \$249 \\
 2. \quad 7 \overline{) \$1743} \\
 \underline{14} \\
 34 \\
 \underline{28} \\
 63 \\
 \underline{63}
 \end{array}$$

$$\begin{array}{r}
 \$86.8 \\
 3. \quad 8 \overline{) \$694.4} \\
 \underline{64} \\
 54 \\
 \underline{48} \\
 6.4 \\
 \underline{6.4}
 \end{array}$$

4. Divide \$5748 by 4.

7.  $\$534.08 \div 8.*$ 

5. Divide \$6785 by 5.

8.  $\$598.7 \div 9.$ 

6. Divide \$108.01 by 7.\*

9.  $\$327.78 \div 6.*$ 

$$\begin{array}{r}
 \$825 \\
 10. \quad 24 \overline{) \$19800} \\
 \underline{192} \\
 60 \\
 \underline{48} \\
 120 \\
 \underline{120}
 \end{array}$$

$$\begin{array}{r}
 \$132 \\
 11. \quad 23 \overline{) \$3036} \\
 \underline{23} \\
 73 \\
 \underline{69} \\
 46 \\
 \underline{46}
 \end{array}$$

$$\begin{array}{r}
 \$7.25 \\
 12. \quad 25 \overline{) \$181.25} \\
 \underline{175} \\
 6.2 \\
 \underline{50} \\
 1.25 \\
 \underline{1.25}
 \end{array}$$

13. Divide \$14112 by 21.

16. Divide \$141.12 by 21.

14. Divide \$18798 by 26.

17. Divide \$187.98 by 26.

15. Divide \$296.64 by 32.

18. Divide \$2966.4 by 32.

\* \$108.01 may be read 108 and  $\frac{1}{100}$  dollars, or 10 thousand 8 hundred 1 hundredths dollars, or one hundred eight dollars and one cent. The others may be read similarly.

The pupil should solve Examples 1, 2, 3 and 10, 11, 12, as well as the others to learn the form.

19. Tell the meaning of each example which is not solved in this lesson. The 4th example means, find  $\frac{1}{4}$  of \$5748.

20. Tell a number story suggested by each unsolved example. The 4th example might suggest the following: If 4 houses cost \$5748, the average cost of the houses is \_\_\_\_\_ dollars.

### CXII. LONG DIVISION. TENTHS AND HUNDREDTHS

1.	2.	3.
234 times	823 times	729 times
$\$6 \overline{) \$1404}$	$\$.6 \overline{) \$493.8}$	$\$.06 \overline{) \$43.74}$
12	48	42
<u>20</u>	<u>13</u>	<u>1.7</u>
18	12	1.2
<u>24</u>	<u>1.8</u>	<u>.54</u>
	<u>1.8</u>	<u>.54</u>

- |                             |                             |
|-----------------------------|-----------------------------|
| 4. Divide \$2294 by \$.7.   | 7. Divide \$506.8 by \$.7.  |
| 5. Divide \$591.5 by \$.7.  | 8. Divide \$51.38 by \$.07. |
| 6. Divide \$20.51 by \$.07. | 9. Divide \$4746 by \$.7.   |

10.	11.	12.
817 times	139 times	158 times
$\$32 \overline{) \$26144}$	$\$3.2 \overline{) \$444.8}$	$\$.32 \overline{) \$50.56}$
256	32	32
<u>54</u>	<u>124</u>	<u>18.5</u>
32	96	16.0
<u>224</u>	<u>28.8</u>	<u>2.56</u>
<u>224</u>	<u>28.8</u>	<u>2.56</u>

13. Divide \$4224 by \$32.

14. Divide \$1683.4 by \$3.2.

15. Divide \$216.96 by \$.32.

16. Divide \$3120.2 by \$3.2.

17. Tell the meaning of each unsolved example. Example 4 means, find how many times \$7 are contained in \$2294.

18. Tell a story suggested by each unsolved example. You might say for Example 4, at \$7 each — sheep can be bought for \$2294.

NOTE. — If the pupils have a clear understanding of the meaning of these examples, no rule for pointing off the results will be needed.

### CXIII. MULTIPLICATION AND DIVISION. TENTHS AND HUNDREDTHS

1. Multiply 84 by 3.6.

$  \begin{array}{r}  84 \\  3.6 \\  \hline  504 \\  252 \\  \hline  302.4  \end{array}  $	$  \begin{array}{l}  \frac{6}{10} \text{ of } 84 = 6 \text{ times } \frac{1}{10} \text{ of } 84. \quad \frac{1}{10} \text{ of } 84 \text{ is } 8.4; \\  6 \text{ times } 8.4 = 50.4 \\  3 \text{ times } 84 = 252. \\  50.4 + 252 = 302.4  \end{array}  $
---	---

302.4    3.6 times 84.

How many decimal places in both multiplier and multiplicand? How many in the product?

2. Multiply 96 by 3.6. This means 3 times 96 plus .6 of 96.

$$96 \times 3.6 =$$

3. Multiply 63 by 4.5. This means, ——.  $63 \times 4.5 =$

4. Multiply 75 by 3.7. This means, ——.  $75 \times 3.7 =$

5. Multiply 89 by 4.9. This means, —.

6. Divide 765 bu. by 5 bu. This means, find —.

7. Divide 85.5 bu. by .5 bu. This means, —.

8. Divide 47.25 bu. by .05 bu. This means, —.

9. Divide 8475 ft. by 25 ft. This means, —.

10. Divide 522.5 ft. by 2.5 ft. This means, —.

11. Divide 34.25 ft. by .25 ft. This means, —.

#### DRILL

*Multiply :*

$$\begin{array}{r} 12. \quad 84 \\ \quad 91 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 64\frac{3}{4} \\ \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 16. \quad 28\frac{2}{3} \\ \quad 9 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 75 \\ \quad 2.8 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 53.4 \\ \quad 18 \\ \hline \end{array}$$

$$\begin{array}{r} 17. \quad 7.6 \\ \quad 38 \\ \hline \end{array}$$

*Divide :*

$$18. \quad 4 \text{ pk. } \overline{)72144} \text{ pk.}$$

$$24. \quad 128 \overline{)39552}$$

$$19. \quad .4 \text{ pk. } \overline{)542.4} \text{ pk.}$$

$$25. \quad 12.8 \overline{)3955.2}$$

$$20. \quad .04 \text{ pk. } \overline{)84.36} \text{ pk.}$$

$$26. \quad 1.28 \overline{)395.52}$$

$$21. \quad 36 \text{ pk. } \overline{)15228} \text{ pk.}$$

$$27. \quad 128 \overline{)3955.2}$$

$$22. \quad 3.6 \text{ pk. } \overline{)1522.8} \text{ pk.}$$

$$28. \quad 128 \overline{)395.52}$$

$$23. \quad .36 \text{ pk. } \overline{)152.28} \text{ pk.}$$

$$29. \quad .64 \overline{)395.52}$$

## CXIV. TENTHS. RATIO

(The pupil should understand that  $1.8 = 18$  tenths, etc.)

1. 2 apples are ——— of 4 apples.
2. One fourth is ——— of one half.
3. One tenth is ——— of two tenths.
4. Four tenths are ——— of eight tenths.
5. .3 are ——— of .6. .3 are ——— of 1.2.
6. .6 are ——— of 1.2. .5 are ——— of 1.5.
7. .9 are ——— of 1.8. .6 are ——— of 2.4.
8. 2.4 are ——— of 4.8. 2.5 are ——— of 5.
9. One half of 1 (1.0) is ——— tenths.
10. One fifth of 1 (1.0) is ——— tenths.
11. One fourth of 6 (6.0) is ——— tenths, or ——— and ——— tenths.
12. Three fourths of 6 are ——— tenths, or ——— and ——— tenths.
13. .2 is ——— of 2 (2.0). .4 is ——— of 2.
14. .4 is ——— of 4. .6 is ——— of 3.
15. .5 is ——— of 2. .5 is ——— of 3.
16.  $3.4 \times 2 =$      $4.2 \div .7 =$      $7.2 \div 8 =$
17.  $4.2 \times 3 =$      $5.6 \div .8 =$      $5.4 \div 6 =$
18. Make concrete examples of the 16th and 17th exercises; as, 2 bags of sugar, each weighing 3.4 pounds, will weigh 6.8 pounds. By giving each child .7 of a dollar, 4.2 dollars could be given to 6 children.



- |                               |                       |
|-------------------------------|-----------------------|
| 19. Divide 1756 by 28.        | 24. $8 \div .5 =$     |
| 20. Divide 175.6 by 2.8.      | 25. $17 \div .5 =$    |
| 21. Divide 17.56 by .28.      | 26. $18 \div .4 =$    |
| 22. Divide 364 by .8 (364.0). | 27. $22 \div .4 =$    |
| 23. Divide 376 by .5.         | 28. $3.4 \times 25 =$ |

**CXV. HUNDREDTHS, RATIO**

(The pupil should understand clearly that  $1.25 = 125$  hundredths, and he should be required to give both readings.)

1. Four hundredths are ——— of 8 hundredths.
2. Two hundredths are ——— of six hundredths.
3. 5 hundredths are ——— of 15 hundredths.
4. .06 are ——— of .18.
5. .07 are ——— of .21.
6. .03 are ——— of .12.
7. One half of 2.48 is ——— hundredths, or ——— and ——— hundredths.
8.  $\frac{1}{2}$  of 6.24 is ——— hundredths, or ——— and ——— hundredths.
9.  $\frac{1}{3}$  of 8.76 is ——— hundredths, or ——— and ——— hundredths.
10.  $\frac{1}{4}$  of 5 (5.00) is ———.
11.  $\frac{3}{4}$  of 5 are ———.
12.  $\frac{1}{3}$  of 1.35 is ———.
13.  $\frac{2}{3}$  of 1.35 are ———.

## DRILL

- |               |           |           |           |           |
|---------------|-----------|-----------|-----------|-----------|
| 14. $5)\$6$   | $5)\$7$   | $5)\$8$   | $5)\$9$   | $5)\$11$  |
| 15. $4)\$5$   | $4)\$6$   | $4)\$7$   | $4)\$9$   | $4)\$13$  |
| 16. $5)\$30$  | $5)\$31$  | $5)\$32$  | $5)\$33$  | $5)\$34$  |
| 17. $4)\$30$  | $4)\$31$  | $4)\$32$  | $4)\$33$  | $4)\$34$  |
| 18. $5)\$241$ | $5)\$242$ | $5)\$243$ | $5)\$244$ | $5)\$245$ |
| 19. $4)\$241$ | $4)\$242$ | $4)\$243$ | $4)\$244$ | $4)\$245$ |

20. Give meanings of the 14th and 15th exercises; as, find  $\frac{1}{5}$  of \$6,  $\frac{1}{5}$  of \$7, and so on.

## CXVI. TENTHS

- One tenth of 1 is ——— tenth.  $1 \div 10 = .2$  of 1 =
- One tenth of 2 is ——— tenths.  $2 \div 10 = .2$  of 2 =
- One tenth of 3 is ——— tenths.  $3 \div 10 = .2$  of 3 =
- One tenth of 4 is ——— tenths.  $4 \div 10 = .2$  of 4 =
- $\$27 \times .1$  means, find .1 of \$27. .1 of \$27 =
- $\$28 \times .2$  means, find ———. .2 of \$28 =
- $\$29 \times .3$  means, ———. .3 of \$29 =
- $\$30 \times .4$  means, ———. .4 of \$30 =
- $\$43 \times .5$  means, ———. .5 of \$43 =
- $\$30 \times 3.2$  means, find 3 times \$30 plus .2 of \$30.  
 $\$30 \times 3.2 =$
- $\$40 \times 2.3$  means, find 2 times \$40 plus .3 of \$40.  
 $\$40 \times 2.3 =$

## DRILL

*Multiply :*

$$\begin{array}{r} 12. \ 120 \\ \underline{2.3} \end{array}$$

$$\begin{array}{r} 13. \ 426 \\ \underline{2.3} \end{array}$$

$$\begin{array}{r} 14. \ 721 \\ \underline{3.2} \end{array}$$

$$\begin{array}{r} 15. \ 824 \\ \underline{4.2} \end{array}$$

$$\begin{array}{r} 16. \ 223 \\ \underline{7.2} \end{array}$$

$$\begin{array}{r} 17. \ 36 \text{ pints} \\ \underline{2.4} \end{array}$$

$$\begin{array}{r} 18. \ 46 \text{ pints} \\ \underline{3.6} \end{array}$$

$$\begin{array}{r} 19. \ 8.6 \text{ quarts} \\ \underline{48} \end{array}$$

$$\begin{array}{r} 20. \ 3.8 \text{ quarts} \\ \underline{29} \end{array}$$

$$\begin{array}{r} 21. \ 28 \text{ quarts} \\ \underline{3\frac{1}{7}} \end{array}$$

$$\begin{array}{r} 22. \ 35 \text{ gal.} \\ \underline{5\frac{1}{7}} \end{array}$$

$$\begin{array}{r} 23. \ 36 \text{ gal.} \\ \underline{9\frac{1}{4}} \end{array}$$

$$\begin{array}{r} 24. \ 48 \text{ gal.} \\ \underline{8\frac{1}{3}} \end{array}$$

$$\begin{array}{r} 25. \ 69 \text{ gal.} \\ \underline{7\frac{1}{3}} \end{array}$$

$$26. \ 64 \times 2.3 =$$

$$30. \ \$6.48 \div \$.04 =$$

$$34. \ \$6 \div \$\frac{1}{4} =$$

$$27. \ 7.8 \times 24 =$$

$$31. \ \$8.4 \div \$.7 =$$

$$35. \ \$6 \div \$.25 =$$

$$28. \ 68 \times 5\frac{1}{7} =$$

$$32. \ \$8 \div \$\frac{1}{2} =$$

$$36. \ \$12 \div 5 =$$

$$29. \ \$64 \div \$4 =$$

$$33. \ \$8 \div \$.5 =$$

$$37. \ \$12 \div \$5 =$$

## CXVII. APPLICATIONS

1. One chair is 3.4 ft. from my foot. Another chair is 2.3 ft. from my foot on the opposite side. The two chairs are —— feet apart.

2. A farmer's barn is 84.5 ft. from his house. How many feet will the farmer walk in making 3 "round trips" to his barn?

3. A certain village is 14.3 miles from New York. How many miles must a man travel in a week, if he makes a "round trip" each day?

4. Two men started from the same place and traveled in the same direction. One walked 3.8 miles a day for 5 days, the other walked 3.5 miles a day for 5 days. How far were they apart at the end of the 5 days?

## DRILL

<i>Add:</i>	<i>Subtract:</i>	<i>Multiply:</i>	<i>Divide:</i>
5. $6\frac{1}{2}$	8. $6\frac{7}{8}$	13. $40\frac{3}{4}$	18. \$18 by \$3.
$3\frac{1}{4}$	$5\frac{1}{4}$	$\frac{7}{7}$	19. 6.2 gal. by 4.
$8\frac{1}{3}$	9. $8\frac{3}{4}$	14. $62\frac{2}{5}$	20. 7.5 by 5.
6. 5.6	$6\frac{1}{2}$	$\frac{6}{6}$	21. 7.6 pints by 4 pints.
3.8	10. 9.6	15. 24	22. 6.4 by .4.
7.3	2.8	$6\frac{2}{3}$	23. 76 by .04.
7. 4.25	11. 13.74	16. 32	
6.08	$6.39$	$2.4$	
$2.39$	12. 64	17. 6.3	
	$2.7$	$75$	

## XXVIII. HUNDREDTHS

- 35 hundredths = — tenths and — hundredths.
- 17 hundredths = — tenth and — hundredths.
- \$.23 = — tenths and — hundredths of a dollar.
- \$.59 = — tenths and — hundredths of a dollar.
- One half dollar = — hundredths of a dollar.
- One fourth dollar = — hundredths of a dollar.
- Three fourths dollar = — hundredths of a dollar.

8. \$.54 and \$.23 are \$ ———.
9. \$.34 less \$.12 are \$ ———.
10. \$.75 divided by \$.25 = ———.
11. \$.50 divided by 2 = \$ ———.
12. .1 = ——— hundredths.      18.  $\$1.84 \div 4 =$
13. .2 = ——— hundredths.      19.  $\$1.84 \div \$.04 =$
14. .40 = ——— tenths.      20. 1.2 = ——— hundredths.
15. .50 = ——— tenths.      21. 4.2 = ——— hundredths.
16.  $\$.84 \div 4 =$       22.  $\$8.4 =$  ——— cents.
17.  $\$.84 \div \$.04 =$       23.  $\$5.6 =$  ——— cents.

## DRILL

<i>Add :</i>		<i>Subtract :</i>	<i>Multiply :</i>
24. $\$3.78$	27. 6.3	30. $\$94$	34. 78
6.92	4.8	1.72	$6\frac{1}{3}$
5.63	5.2		
25. $\$9.08$	28. $17\frac{1}{5}$	31. $\$75.08$	35. 65
3.00	$84\frac{1}{2}$	49.39	$7\frac{1}{5}$
7.49	$13\frac{1}{10}$		
26. $\$5\frac{1}{4}$	29. $894\frac{2}{3}$	32. $68\frac{1}{2}$	36. 65
$7\frac{1}{8}$	$678\frac{5}{9}$	$28\frac{1}{4}$	7.2
16			
		33. $69\frac{7}{8}$	37. 75
		$8\frac{3}{4}$	8.4

*Divide :*

38. .8 by .4.\*      40. .9 by 3.\*      42. 6.3 by 3.\*
39. 7 by 4.\*      41. 6.3 by 2.1.\*      43. 6.3 by .3.\*

\* Require meaning in case of hesitation.

## CXIX. REVIEW

1. Find the sum of \$18.2, \$6.5, and \$42.
2. Find the sum of \$4.28, \$15.29, and \$342.
3. Find the difference of \$18.23 and \$5.64.
4. Find the difference of \$24 and \$3.94.
5. Find the product of \$23.72 and 6.
6. Find the product of \$1421 and .3.
7. Find the product of \$84 and 2.5.
8. Find the quotient of \$32.64 divided by \$.08.
9. Find the quotient of \$45.24 divided by 4.
10. Find the quotient of \$75.6 divided by \$.3.
11. Find the quotient of \$384.3 divided by 9.
12. Find the quotient of 81.2 pounds divided by 7.
13.  $18.5 \text{ lb.} \times 9 =$
14.  $185 \text{ lb.} \times .8 =$
15.  $74 \text{ lb.} \times 5.3 =$
16.  $42.5 \text{ lb.} + .5 \text{ lb.} =$
17.  $103.4 \text{ qt.} + 2.2 \text{ qt.} =$
18.  $10.35 \text{ qt.} + 2.3 \text{ qt.} =$
19.  $12 + .2 =$
20.  $7 \times .2 =$

## DRILL

21.  $18.4 + 25.3 + 16.2 =$
22.  $8.54 + 2.08 + 64 =$
23.  $14\frac{1}{2} + 16\frac{3}{4} =$
24.  $23\frac{1}{2} + 4.5 =$
25.  $15\frac{1}{3} + 16\frac{2}{9} =$
26.  $16\frac{1}{2} - 4\frac{1}{3} =$
27.  $16.3 - 4.2 =$
28.  $24.63 - 19.58 =$
29.  $67 - 4\frac{5}{9} =$
30.  $18\frac{1}{8} - 3\frac{3}{8} =$

31.  $6\frac{7}{8} \times 2 =$

34.  $10 \div .1 = *$

32.  $6.7 \times 2 =$

35.  $4 + .01 = *$

33.  $8 \times 2\frac{3}{4} =$

36.  $.6 + .3 =$

**CXX. MULTIPLICATION, HUNDREDTHS**

1.  $400 \times .05$  means find 5 hundredths of 400. .05 of 400 =

2.  $400 \times .06$  means find 6 hundredths of 400. .06 of 400 =

3.  $300 \times .07$  means find 7 hundredths of 300. .07 of 300 =

4.  $421 \times .01$  means ——. .01 of 421 =

5.  $421 \times .02$  means ——. .02 of 421 =

6.  $421 \times .03$  means ——. .03 of 421 =

7.  $625 \times .04$  means ——. .04 of 625 =

8.  $\$36 \times .01$  means ——. .01 of  $\$36 =$

9.  $\$36 \times .02$  means ——. .02 of  $\$36 =$

10.  $\$54 \times .01$  means ——. .01 of  $\$54 =$

11.  $\$54 \times .04$  means ——. .04 of  $\$54 =$

12.  $\$7 \times .01$  means ——. .01 of  $\$7 =$

13.  $\$7 \times .05$  means ——. .05 of  $\$7 =$

14.  $\$9 \times .07$  means ——. .07 of  $\$9 =$

15.  $\$11 \times .09$  means ——. .09 of  $\$11 =$

\* Require meaning in case of hesitation.

16. $4 \times 5 =$	$4 \times .5 =$	$4 \times .05 = *$
17. $32 \times 5 =$	$32 \times .5 =$	$32 \times .05 =$
18. $52 \times 4 =$	$52 \times .4 =$	$52 \times .04 =$
19. $80 \times 4 =$	$80 \times .4 =$	$80 \times .04 =$
20. $200 \times 6 =$	$200 \times .6 =$	$200 \times .06 =$
21. $300 \times 3 =$	$300 \times .01 =$	$300 \times 2.01 =$
22. $300 \times 5 =$	$300 \times .03 =$	$300 \times 2.0 = 3$

## CXXI. APPLICATIONS

When wood cost \$6 a cord, —

1. 3 cords cost —. 4 cords cost —. 5 cords cost —.

2. .1 of a cord costs —. .2 of a cord costs —. .3 of a cord costs —.

3. 2.1 cords cost —. 2.2 cords cost —. 3.3 cords cost —.

When wheat bran costs \$30 a ton, —

4. 4 tons cost —. 5 tons cost —. .1 of a ton costs —.

5. .2 of a ton costs —. .3 of a ton costs —. 2.1 tons cost —.

6. 2.2 tons cost —. 3.3 tons cost —. 2.4 tons cost —.

\* Be sure that the pupils know the meaning of every expression before they are required to do the work. In this book, the sign ( $\times$ ) is read "multiplied by."



When land costs \$200 an acre,—

7. 2 acres cost \_\_\_\_\_. .1 of an acre costs \_\_\_\_\_. .2 of an acre cost \_\_\_\_\_.

8. .3 of an acre cost \_\_\_\_\_. .6 of an acre cost \_\_\_\_\_. .01 of an acre costs \_\_\_\_\_.

9. .02 of an acre cost \_\_\_\_\_. .03 of an acre cost \_\_\_\_\_. .04 of an acre cost \_\_\_\_\_.

10. 1.1 acres cost \_\_\_\_\_. 3.2 acres cost \_\_\_\_\_. 2.3 acres cost \_\_\_\_\_.

11. 1.01 acres cost \_\_\_\_\_. 3.02 acres cost \_\_\_\_\_. 2.03 acres cost \_\_\_\_\_.

When hay is \$20 a ton,—

12. 3 tons cost \_\_\_\_\_. 4 tons cost \_\_\_\_\_. .1 of a ton costs \_\_\_\_\_.

13. .3 of a ton cost \_\_\_\_\_. .01 of a ton costs \_\_\_\_\_. .02 of a ton cost \_\_\_\_\_.

14. 3.1 tons cost \_\_\_\_\_. 3.01 tons cost \_\_\_\_\_. 1.02 tons cost \_\_\_\_\_.

#### DRILL

15.  $\$40 \times 2 =$       19.  $\$500 \times 3 =$       23.  $\$60 \times 4 =$

16.  $\$40 \times 1.2 =$       20.  $\$500 \times .3 =$       24.  $\$60 \times .4 =$

17.  $\$40 \times 2.3 =$       21.  $\$500 \times 2.3 =$       25.  $\$60 \times 2.4 =$

18.  $\$40 \times 1.02 =$       22.  $\$500 \times 2.03 =$       26.  $\$60 \times 2.04 =$

27. At \$320 an acre, what will be the cost of 3.04 acres of land?

## CXXII. RATIO AND PROPORTION

1. The ratio of  $\frac{1}{4}$  to  $\frac{1}{2}$  is ———.
2. The ratio of .25 to .5 (.50) is ———.
3. The ratio of  $\frac{1}{2}$  to  $\frac{1}{4}$  is ———.
4. The ratio of .5 to .25 is ———.
5. The ratio of 5 to 20 is ———.
6. The ratio of .2 to .8 is ———.
7. The ratio of 7 to 21 is ———.
8. The ratio of .25 to .75 is ———.
9. If .50 of my land are worth \$600, what are .25 of it worth?
10. If .8 of my money are \$40, what are .2 of it?
11. If .75 of my weight are 120 pounds, what are .25 of it?
12. .5 of 40 = .25 of ———. (.25 = what common fraction?)
13. .75 of 40 = .25 of ———.
14. .75 of 40 = .50 of ———.
15. A farmer paid \$8 for a sheep and .2 as much for a lamb. The lamb cost ———.
16. If  $\frac{1}{2}$  of the distance between New York and Albany is 66 miles, what is  $\frac{1}{4}$  of the distance?

*Multiply:*

- |            |           |                                  |                                  |                     |
|------------|-----------|----------------------------------|----------------------------------|---------------------|
| 17. 64     | 18. 8.5   | 19. 48                           | 20. 64                           | 21. $18\frac{3}{5}$ |
| <u>2.8</u> | <u>84</u> | <u><math>9\frac{1}{4}</math></u> | <u><math>8\frac{3}{4}</math></u> | <u>9</u>            |

**CXXIII. MULTIPLICATION. HUNDREDTHS**

1. Multiply \$423 by 2.34. This means find 2 times \$423 + .3 of \$423 + .04 of \$423.

\$423 1 hundredth of \$423 is \$4.23.

2.34 4 hundredths of \$423 are 4 times \$4.23 = \$16.92.

\$16 92 1 tenth of \$423 is \$42.3.

\$126 9 3 tenths of \$423 are 3 times \$42.3 = \$126.9.

\$846 2 times \$423 = \$846.

\$989.82 2.34 times \$423 = \$989.82.

How many decimal places in both multiplier and multiplicand? How many in the product?

2. Multiply \$621 by 4.23. This means ——. (See the 1st example.)

3. Multiply \$547 by 2.69. This means —.

4. Multiply \$398 by 3.87. This means —.

5. Multiply \$2.76 by 27. This means —.

6. Multiply \$276 by 5.64. This means —.

7. Multiply \$8.39 by 403. This means —.

8. Multiply \$392 by 2.35. This means —.

**DRILL**

9.  $4.7 \times 3 =$       14.  $\$3 \div 4 =$       19.  $4.25 \div 25 =$

10.  $4.2 \div .6 =$       15.  $\$2.56 \div 4 =$       20.  $4.25 \div .25 =$

11.  $6\frac{1}{2} \div 2 =$       16.  $\$7 \div 5 =$       21.  $4.25 \div .05 =$

12.  $8\frac{1}{2} \div 4 =$       17.  $\$9 \div \$4 =$       22.  $42.5 \div 5 =$

13.  $16\frac{3}{4} \div 2 =$       18.  $6.8 \div .4 =$       23.  $42.5 \div .5 =$

## CXXIV. APPLICATIONS

1. A man rode 3.5 miles one hour and 4.35 miles another hour. In the two hours he rode — miles.

2. A grocer paid \$7.25 for potatoes and \$3.75 for carrots. For both vegetables he paid —.

3. A man gave a 5-dollar bill in payment for a pair of shoes costing \$2.35 and some shoe polish costing \$.15. He should receive — in change.

4. A dealer having \$375.25 bought a horse for \$130.50 and a wagon for \$100.75. How much money had he left?

5. If a ton of hay cost \$20.50, two tons will cost —.

6. Find the cost of 6 tons of hay at \$23.75 a ton.

7. For \$.60, at \$.04 each I can buy — pears.

8. How many quarts of berries can be bought for \$18.48, if each quart costs \$.12?

9. If 7 loaves of bread cost \$.56, each loaf costs —.

10. At \$.05 apiece \$3 will pay for — pencils.

## DRILL

11.  $4.2 + 18.35 + 6.24 =$

17.  $8.1 \div .9 =$

12.  $82 - 6.2 =$

18.  $\$5.2 + \$3.42 =$

13.  $94 - 21.35 =$

19.  $\$5.2 - \$3.42 =$

14.  $84 \times .2 =$

20.  $\$5.2 \times 4 =$

15.  $16 \times 1.3 =$

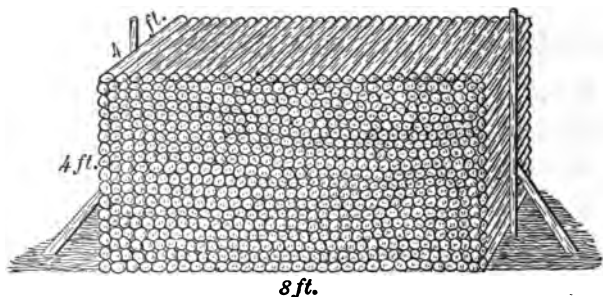
21.  $\$5.2 \div \$.4 =$

16.  $25.3 \times 175 =$

22.  $\$5.2 \div 4 =$

**CXXV. CORD**

1. A pile of wood 8 ft. long, 4 ft. wide, and 4 ft. high, as shown in the drawing, is called a **cord** of wood.



2. A cord = 8 cu. ft.  $\times 4 \times 4 =$  — cubic feet.\*
3. 3 cords = — cu. ft.
4. 2.5 cords = — cu. ft.
5. 3.4 cords = — cu. ft.
6. How many cubic feet in 5.4 cords of wood?
7. How many half cords in 2 cords?
8. A man wishes to draw 6 cords of wood. How many loads must he draw, if he draws  $\frac{3}{4}$  of a cord to a load?

**DRILL**

- |                              |                         |                   |
|------------------------------|-------------------------|-------------------|
| 9. $4\frac{2}{3} \times 6 =$ | 11. $72 \times 2.8 =$   | 13. $4 + .02 =$   |
| 10. $8.5 \times 4 =$         | 12. $492 \times 4.23 =$ | 14. $.24 + .12 =$ |

\* That portion of the pile at the bottom 8 ft. long, 1 ft. wide, and 1 ft. high contains 8 cu. ft. The portion 8 ft. long, 4 ft. wide, and 1 ft. high contains 32 cu. ft. The whole, 8 ft. long, 4 ft. wide, and 4 ft. high, contains 128 cu. ft.

## CXXVI. CUBIC YARD

1. A rectangular solid 1 yard long, 1 yard wide, and 1 yard high is a cubic yard. It is — feet long, — feet wide, and — feet high.

2. The cubic yard equals — cubic feet.

3. 2 cu. yd. (cubic yards) equal — cu. ft.

4.  $2\frac{1}{3}$  cu. yd. = — cu. ft.  $3\text{ ft.}$

5.  $3\frac{1}{3}$  cu. yd. = — cu. ft.

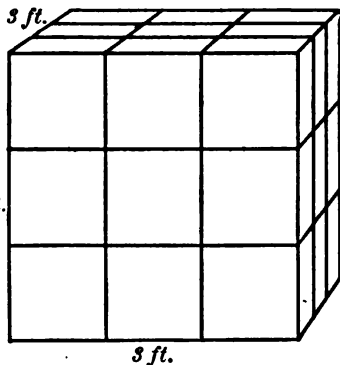
6. 54 cu. ft. = — cu. yd.

7. 81 cu. ft. = — cu. yd.

8.  $8\text{ cu. yd.} \div 2\text{ cu. yd.} = \text{—}.*$

9.  $14\text{ cu. yd.} \div .7\text{ of a cu. yd.} = \text{—}.$

10. A cellar 10 yd. long, 7 yd. wide, and 2 yd. deep was dug in two days. How many cubic yards were dug each day? That portion of the cellar 10 yd. long, 7 yd. wide, and 1 yd. deep has a volume of — cu. yd. Then the *whole* cellar, which is 10 yd. long, 7 yd. wide, and 2 yd. deep, must have a volume of — cu. yd. In 1 day — of — cu. yd., or — cu. yd., must have been dug. (Note the fact that 1 yd. in depth is — of the cellar.)



11.  $5\text{ cu. yd.} \times 2\frac{1}{2} =$

14.  $5\text{ cu. yd.} \times 4\frac{2}{5} =$

12.  $5\text{ cu. yd.} \div \frac{1}{4}\text{ of a cu. yd.} =$

15.  $5\text{ cu. yd.} \times 3.2 =$

13.  $5\text{ cu. yd.} \div .5\text{ of a cu. yd.} =$

16.  $5\text{ cu. yd.} \times 3.02 =$

\* A cubic yard of earth is usually considered a load for a two-horse team

## CXXVII. REVIEW

1. A cistern 8 ft. long, 6 ft. wide, and 5 ft. deep has a volume of — cu. ft.
2. How many cu. yd. in the cistern ? (3 twenty-sevenths = 1 ninth.)
3. How many cu. yd. in 10503 cu. ft. ?
4. How many cu. ft. in 5 cu. yd. ?
5. Reduce (change) 3 bu. 2 pk. to pecks. (How many pecks in 3 bu. 2 pk. ?)
6. Reduce 3 bu. 2 pk. 6 qt. to quarts.
7. Reduce 4 gal. 3 qt. to quarts.
8. Reduce 4 gal. 3 qt. 1 pt. to pints.
9. Reduce 2 yd. 2 ft. to feet.
10. Reduce 2 yd. 2 ft. 6 in. to inches.
11. Reduce 3 cu. yd. to cubic feet.
12. Reduce 3 cu. yd. 5 cu. ft. to cu. ft.
13. 63 qt. = — pk. — qt. (1 pk. = 8 qt.)
14. 38 qt. = — gal. — qt.
15. 15 pt. = — qt. — pt.
16. 79 in. = — ft. — in.
17. 41 ft. = — yd. — ft.
18. 108 cu. ft. = — cu. yd.

Require pupils to do mentally all work possible, using the pencil only when necessary.

## CXXVIII. FOURTEENTHS



$$\frac{1}{2} = \frac{7}{14}$$



$$\frac{1}{7} = \frac{2}{14}$$

1. In one whole there are — fourteenths.
2. One half = — fourteenths.
3. One seventh = — fourteenths.
4. One half and one fourteenth = — fourteenths.
5. One half and 3 fourteenths = — fourteenths.
6. One half less one fourteenth = — fourteenths.
7. One half less 3 fourteenths = — fourteenths.
8. One half and one seventh = — fourteenths.
9. One half less one seventh = — fourteenths.
10. One half less two sevenths = — fourteenths.
11. One seventh and one fourteenth = — fourteenths.
12. One seventh less one fourteenth = — fourteenths.
13.  $\frac{1}{2} + \frac{3}{14} =$   $\frac{1}{2} + \frac{5}{14} =$   
(Change result to 7ths.)
14.  $\frac{1}{2} + \frac{1}{7} =$  (Change to —.)  $\frac{1}{2} + \frac{2}{7} =$
15.  $\frac{1}{2} - \frac{3}{14} =$   $\frac{1}{2} - \frac{5}{14} =$   
(Change result to 7ths.) (Change result to 7ths.)
16.  $\frac{1}{2} - \frac{1}{7} =$  19.  $\frac{1}{7} \times 3 =$   $\frac{2}{7} \div \frac{1}{14} =$   $21 \times \frac{1}{7} =$
17.  $\frac{1}{2} \times 7 =$  20.  $\frac{1}{7} \div \frac{1}{14} =$   $\frac{3}{7} \div \frac{1}{14} =$   $28 \times \frac{2}{7} =$
18.  $\frac{1}{14} \times 9 =$  21.  $\frac{1}{7} \div 2 =$   $14 \times \frac{1}{7} =$   $3 \div \frac{1}{7} =$



## DRILL

22.  $3 \div \frac{1}{2} =$      $3 \div \frac{2}{3} =$

25.  $3 \div \frac{2}{5} =$      $3 \div \frac{1}{6} =$

23.  $3 \div \frac{1}{3} =$      $3 \div \frac{3}{4} =$

26.  $3 \div \frac{3}{5} =$      $3 \div \frac{5}{6} =$

24.  $3 \div \frac{1}{4} =$      $3 \div \frac{1}{5} =$

27.  $3 \div \frac{4}{5} =$      $3 \div \frac{1}{8} =$

NOTE. — Have the pupils make the drawings.

## CXXIX. MISCELLANEOUS WORK

1.  $8\frac{3}{4} + 5\frac{1}{3} =$

11.  $8 \div .4 = *$

2.  $209\frac{3}{4} \times 98\frac{1}{3} =$

12.  $36 \div .4 =$

3.  $9\frac{3}{4} - 4\frac{1}{3} =$

13.  $\frac{3}{5} \div .1 = *$

4.  $843\frac{3}{4} - 257\frac{1}{3} =$

14.  $\frac{4}{5} \div .2 =$

5.  $16\frac{5}{8} \times 4 =$

15.  $8.4 + .36 =$

6.  $94\frac{5}{8} \times 24 =$

16.  $9.6 + .49 =$

7.  $86\frac{1}{4} \div 2 = *$

17.  $9.2 - 4.25 =$

8.  $284\frac{1}{2} \div 4 =$

18.  $28.2 - 3.47 =$

9.  $\frac{3}{4} \div \frac{1}{2} = *$

19.  $24 \times .3 = *$

10.  $\frac{5}{6} \div \frac{1}{2} =$

20.  $36 \times .3 =$

21. If .3 of a yard of cloth is worth \$.30, .9 of a yard is worth —.

22. At \$.4 a pound for coffee, 5 lb. will cost —.

23. At \$.4 a pound for coffee, \$2.8 will buy — pounds.

24. Mary has \$.48; Jane has \$.05 more. Jane has —.

25. 5 lb. of sugar cost 28 cents. 1 pound costs — cents.

\* Require the meaning in case of hesitation.

**CXXX. ADDITION AND SUBTRACTION**

- |   |                                     |
|---|-------------------------------------|
| 1. $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = *$ (Change to 12ths.) | 20. $\frac{2}{3} - \frac{1}{4} =$   |
| 2. $\frac{1}{3} + \frac{1}{4} + \frac{1}{6} =$ (Change to —.)       | 21. $\frac{1}{3} - \frac{1}{9} =$   |
| 3. $\frac{1}{3} + \frac{1}{5} =$ (Change to —.)                     | 22. $\frac{2}{3} - \frac{1}{9} =$   |
| 4. $\frac{1}{4} + \frac{1}{5} =$ (Change to —.)                     | 23. $\frac{2}{3} - \frac{2}{9} =$   |
| 5. $\frac{1}{3} + \frac{1}{9} =$                                    | 24. $\frac{1}{2} - \frac{1}{12} =$  |
| 6. $\frac{1}{2} + \frac{1}{4} =$                                    | 25. $\frac{1}{3} - \frac{1}{12} =$  |
| 7. $\frac{1}{2} + \frac{3}{4} =$                                    | 26. $\frac{1}{4} - \frac{1}{12} =$  |
| 8. $\frac{1}{2} + \frac{2}{3} =$                                    | 27. $\frac{1}{6} - \frac{1}{12} =$  |
| 9. $\frac{1}{3} + \frac{3}{4} =$                                    | 28. $\frac{2}{3} - \frac{1}{12} =$  |
| 10. $\frac{1}{3} + \frac{2}{5} =$                                   | 29. $\frac{1}{2} - \frac{1}{6} =$   |
| 11. $\frac{1}{3} + \frac{4}{5} =$                                   | 30. $\frac{1}{3} - \frac{1}{6} =$   |
| 12. $\frac{2}{3} + \frac{1}{5} =$                                   | 31. $\frac{1}{12} - \frac{5}{6} =$  |
| 13. $\frac{2}{3} + \frac{3}{5} =$                                   | 32. $2\frac{1}{3} + 1\frac{1}{2} =$ |
| 14. $\frac{1}{2} - \frac{1}{4} =$                                   | 33. $1\frac{1}{5} + 2.1 =$          |
| 15. $\frac{2}{3} - \frac{1}{2} =$                                   | 34. $2\frac{1}{4} + 3\frac{1}{3} =$ |
| 16. $\frac{3}{4} - \frac{1}{2} =$                                   | 35. $5\frac{1}{6} + 4\frac{1}{2} =$ |
| 17. $\frac{3}{4} - \frac{1}{3} =$                                   | 36. $8 - \frac{1}{2} =$             |
| 18. $\frac{3}{4} - \frac{2}{3} =$                                   | 37. $5 - \frac{3}{4} =$             |
| 19. $\frac{1}{3} - \frac{1}{4} =$                                   | 38. $7 - \frac{5}{7} =$             |

Use the pencil sparingly. All of these exercises should be done mentally, if possible. All answers should be expressed in the lowest terms possible.

\* Pupils should say:  $\frac{1}{4} = \frac{3}{12}$ ,  $\frac{1}{3} = \frac{4}{12}$ ; 6 twelfths and 4 twelfths are 10 twelfths.  $\frac{1}{4} = \frac{3}{12}$ .  $\frac{1}{12}$  and  $\frac{1}{12}$  are  $\frac{2}{12}$ ;  $\frac{1}{12} = 1\frac{1}{12}$ .

**CXXXI. MISCELLANEOUS WORK**

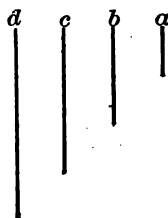
1. The area of a rectangle 5 ft. long and 3 ft. wide is — square feet. Its perimeter is — feet.

2. The area of a triangle whose base is 10 ft. and whose altitude is 4 ft. is — square feet.

3.  $a$  is equal to — — of  $b$ .  $a$  is equal to — % of  $b$ .

4.  $a$  is equal to — — of  $c$ .  $a$  is equal to — % of  $c$ .

5.  $a$  is equal to — — of  $d$ .  $a$  is equal to — % of  $d$ .



6.  $a$  is equal to — tenths of  $b$ .

7.  $a$  is equal to — hundredths of  $c$ .

8.  $a$  is equal to — hundredths of  $d$ .

9.  $8 \div .5 =$

15.  $217.5 \div 2.5 =$

10.  $9 \div .25 =$

16.  $247.5 \div 25 =$

11.  $1 \div 10 =$

17.  $162.5 \div .5 =$

12.  $2 \div 10 =$

18. 50% of \$16 =

13.  $7.25 \div 25 =$

19. 25% of \$36 =

14.  $7.25 \div .25 =$

20.  $33\frac{1}{3}\%$  of \$18 =

21. 20% of \$30 =

22. 9 books are 50% of — books.

23. 7 pears are 25% of — pears.

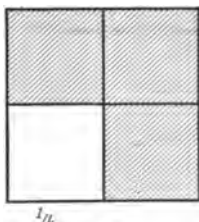
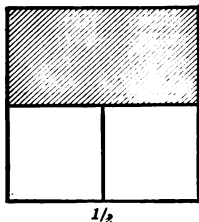
24. 6 apples are  $33\frac{1}{3}\%$  of — apples.

25. 4 oranges are 20% of — oranges.

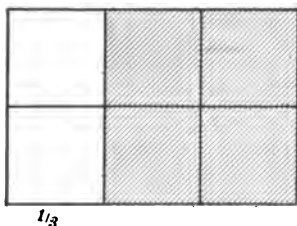
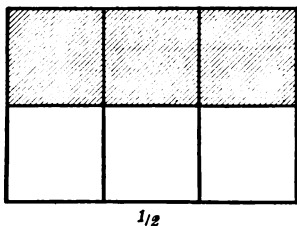
## PART II

### I. ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION OF FRACTIONS. REVIEW

1.  $\frac{1}{2} + \frac{1}{4}$  means  $\frac{1}{2}$  and  $\frac{1}{4}$ .  $\frac{1}{2}$  and  $\frac{1}{4}$  are —.
2.  $\frac{1}{2} - \frac{1}{4}$  means  $\frac{1}{2}$  less  $\frac{1}{4}$ .  $\frac{1}{2}$  less  $\frac{1}{4}$  is —.
3.  $\frac{1}{2} \times 2$  means find 2 times  $\frac{1}{2}$ .\* 2 times  $\frac{1}{2}$  are —.

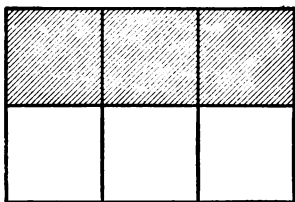
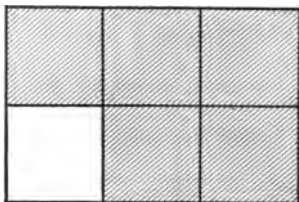


4.  $\frac{1}{2} \div \frac{1}{4}$  means find how many times  $\frac{1}{4}$  is contained in  $\frac{1}{2}$ .  $\frac{1}{4}$  is contained in  $\frac{1}{2}$  — times.
5.  $\frac{1}{2} \div 2$  means find  $\frac{1}{2}$  of  $\frac{1}{2}$ .  $\frac{1}{2}$  of  $\frac{1}{2}$  is —.

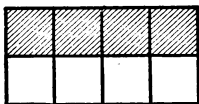
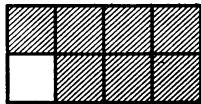


\* The sign ( $\times$ ) in this book is always to be read "multiplied by" to prevent confusion. There is good authority, however, for  $2 \times \$5$  (2 times \$5). See Dr. David Eugene Smith in "Teachers College Record," New York, March, 1903.

6.  $\frac{1}{2} + \frac{1}{3}$  means ——. \*  $\frac{1}{2}$  and  $\frac{1}{3}$  are ——.
7.  $\frac{1}{2} - \frac{1}{3}$  means ——. \*  $\frac{1}{2}$  less  $\frac{1}{3}$  is ——.
8.  $\frac{1}{3} \times 2$  means ——. \* 2 times  $\frac{1}{3}$  are ——.
9.  $\frac{1}{2} \div \frac{1}{3}$  means ——. \*  $\frac{1}{3}$  is contained in  $\frac{1}{2}$  —— times.
10.  $\frac{1}{3} \div 2$  means ——. \*  $\frac{1}{2}$  of  $\frac{1}{3}$  is ——.

 $\frac{1}{2}$  $\frac{1}{6}$ 

11.  $\frac{1}{2} + \frac{1}{6} =$  ——.      16.  $\frac{1}{2} + \frac{1}{8} =$  ——.
12.  $\frac{1}{2} - \frac{1}{6} =$  ——.      17.  $\frac{1}{2} - \frac{1}{8} =$  ——.
13.  $\frac{1}{6} \times 3 =$  ——.      18.  $\frac{1}{8} \times 5 =$  ——.
14.  $\frac{1}{2} \div \frac{1}{6} =$  ——.      19.  $\frac{1}{2} \div 4 =$  ——.
15.  $\frac{1}{2} \div 3 =$  ——.      20.  $\frac{1}{2} \div \frac{1}{8} =$  ——.

 $\frac{1}{2}$  $\frac{1}{8}$ 

## DRILL

21.  $2\frac{1}{2} + 5\frac{1}{4} =$       25.  $15\frac{1}{2} - 2\frac{1}{3} =$       29.  $8\frac{1}{4} \times 3 =$
22.  $4\frac{1}{2} + 7\frac{1}{3} =$       26.  $11\frac{1}{2} - 8\frac{1}{6} =$       30.  $7\frac{1}{3} \times 4 =$
23.  $6\frac{1}{2} + 7\frac{1}{8} =$       27.  $13\frac{1}{2} - 7\frac{1}{8} =$       31.  $4\frac{1}{6} \times 3 =$
24.  $8\frac{1}{2} + 7\frac{1}{6} =$       28.  $7\frac{1}{2} \times 2 =$       32.  $5\frac{1}{8} \times 7 =$

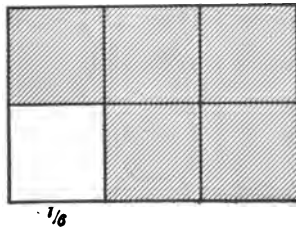
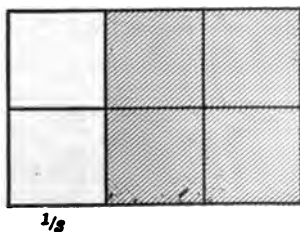
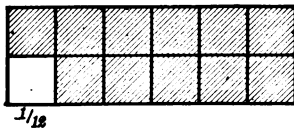
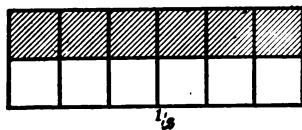
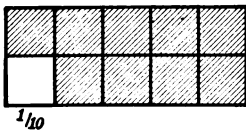
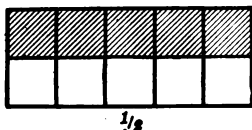
\* Complete the statements as shown in the first five examples.

*Write, filling out the blanks, and learn :*

- |                  |                   |
|------------------|-------------------|
| One 2 is —.      | Seven 2's are —.  |
| Two 2's are —.   | Eight 2's are —.  |
| Three 2's are —. | Nine 2's are —.   |
| Four 2's are —.  | Ten 2's are —.    |
| Five 2's are —.  | Eleven 2's are —. |
| Six 2's are —.   | Twelve 2's are —. |

**II. REVIEW (Continued)**

- |                                      |                                       |                                      |
|--------------------------------------|---------------------------------------|--------------------------------------|
| 1. $\frac{1}{2} + \frac{1}{10} =$    | 6. $\frac{1}{2} + \frac{1}{12} =$     | 11. $\frac{1}{3} + \frac{1}{6} =$    |
| 2. $\frac{1}{2} - \frac{1}{10} =$    | 7. $\frac{1}{2} - \frac{1}{12} =$     | 12. $\frac{1}{3} - \frac{1}{6} =$    |
| 3. $\frac{1}{10} \times 5 =$         | 8. $\frac{1}{12} \times 6 =$          | 13. $\frac{1}{6} \times 3 =$         |
| 4. $\frac{1}{2} \div \frac{1}{10} =$ | 9. $\frac{1}{12} \div \frac{1}{12} =$ | 14. $\frac{1}{3} \div \frac{1}{6} =$ |
| 5. $\frac{1}{2} \div 5 =$            | 10. $\frac{1}{2} \div 6 =$            | 15. $\frac{1}{3} \div 2 =$           |



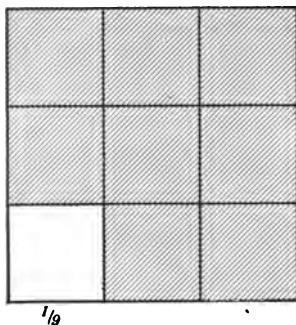
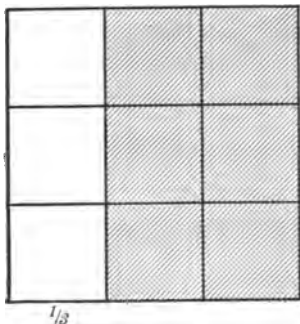
16.  $\frac{1}{3} + \frac{1}{9} =$

18.  $\frac{1}{9} \times 3 =$

20.  $\frac{1}{3} \div \frac{1}{9} =$

17.  $\frac{1}{3} - \frac{1}{9} =$

19.  $\frac{1}{3} \div 3 =$



## DRILL

21.  $7\frac{1}{2} + 5\frac{1}{10} =$

27.  $14\frac{1}{3} - 5\frac{1}{6} =$

33.  $7\frac{1}{9} \times 6 =$

22.  $9\frac{1}{2} + 6\frac{1}{12} =$

28.  $15\frac{1}{3} - 8\frac{1}{9} =$

34.  $6\frac{1}{2} \div 3 =$

23.  $8\frac{1}{3} + 5\frac{1}{6} =$

29.  $7\frac{1}{10} \times 5 =$

35.  $5\frac{1}{2} \div 2 =$

24.  $6\frac{1}{3} + 7\frac{1}{9} =$

30.  $8\frac{1}{12} \times 4 =$

36.  $8\frac{1}{6} \div 2 =$

25.  $8\frac{1}{2} - 3\frac{1}{10} =$

31.  $5\frac{1}{6} \times 5 =$

37.  $12\frac{1}{3} \div 3 =$

26.  $17\frac{1}{2} - 5\frac{1}{12} =$

32.  $7\frac{1}{3} \times 6 =$

38.  $22\frac{1}{2} \div 3 =$

39. If 3 men earn \$22 $\frac{1}{2}$  in a week, how much is that for each man?

*Write, filling out the blanks, and learn :*

One 3 is —.

Seven 3's are —.

Two 3's are —.

Eight 3's are —.

Three 3's are —.

Nine 3's are —.

Four 3's are —.

Ten 3's are —.

Five 3's are —.

Eleven 3's are —.

Six 3's are —.

Twelve 3's are —.

III. REVIEW (Continued)

1.  $\frac{1}{3} + \frac{1}{12} =$

2.  $\frac{1}{3} - \frac{1}{12} =$

3.  $\frac{1}{12} \times 4 =$

4.  $\frac{1}{3} \div \frac{1}{12} =$

5.  $\frac{1}{3} \div 4 =$

6.  $\frac{1}{4} + \frac{1}{8} =$

7.  $\frac{1}{4} - \frac{1}{8} =$

8.  $\frac{1}{8} \times 4 =$

9.  $\frac{1}{4} \div \frac{1}{8} =$

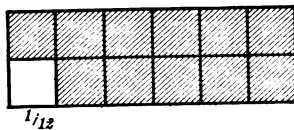
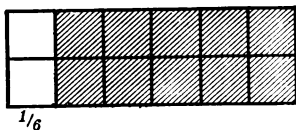
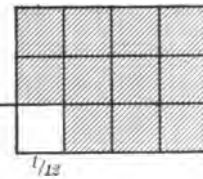
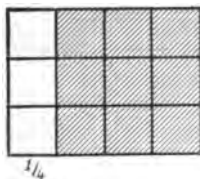
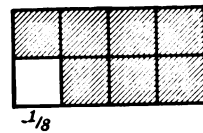
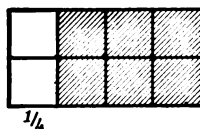
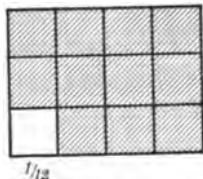
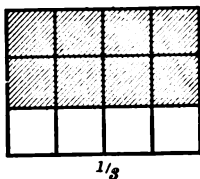
10.  $\frac{1}{4} \div 2 =$

11.  $\frac{1}{4} + \frac{1}{12} =$

12.  $\frac{1}{4} - \frac{1}{12} =$

13.  $\frac{1}{12} \times 3 =$

14.  $\frac{1}{4} \div 3 =$



15.  $\frac{1}{4} \div \frac{1}{12} =$

17.  $\frac{1}{6} - \frac{1}{12} =$

19.  $\frac{1}{6} \div 2 =$

16.  $\frac{1}{6} + \frac{1}{12} =$

18.  $\frac{1}{12} \times 2 =$

20.  $\frac{1}{6} \div \frac{1}{12} =$

DRILL

21.  $13\frac{1}{3} - 5\frac{1}{12} =$

24.  $8\frac{1}{12} \times 6 =$

27.  $8\frac{1}{3} \div 2 =$

22.  $15\frac{1}{4} - 7\frac{1}{8} =$

25.  $5\frac{1}{8} \times 5 =$

28.  $3\frac{1}{3} \div \frac{1}{6} =$

23.  $9\frac{1}{4} - 4\frac{1}{12} =$

26.  $7\frac{1}{12} \times 6 =$

29.  $6\frac{1}{4} \div \frac{1}{4} =$



*Write, filling out the blanks, and learn :*

One 4 is —.	Seven 4's are —.
Two 4's are —.	Eight 4's are —.
Three 4's are —.	Nine 4's are —.
Four 4's are —.	Ten 4's are —.
Five 4's are —.	Eleven 4's are —.
Six 4's are —.	Twelve 4's are —.

#### IV. REVIEW (Continued)

1. Add  $\frac{4}{7}$  and  $\frac{1}{2}$ . Change to —ths.  $\frac{4}{7} = \frac{\quad}{14}$ .  $\frac{1}{2} = \frac{\quad}{14}$ .  
— fourteenths and — fourteenths are  $\frac{\quad}{14}$ , or —  
and — fourteenths.

2. Add  $\frac{3}{5}$  and  $\frac{2}{3}$ . Change to —ths.  $\frac{3}{5} = \frac{\quad}{15}$ .  $\frac{2}{3} = \frac{\quad}{15}$ .  
— fifteenths and — fifteenths are  $\frac{\quad}{15}$ , or — and  
— fifteenths.

3. From  $\frac{6}{7}$  subtract  $\frac{1}{2}$ . Change to —ths.  $\frac{6}{7} = \frac{\quad}{14}$ .  
 $\frac{1}{2} = \frac{\quad}{14}$ . — fourteenths less — fourteenths are  $\frac{\quad}{14}$ ,  
or 7.

4. From  $\frac{4}{5}$  subtract  $\frac{2}{3}$ . Change to —ths.  $\frac{4}{5} = \frac{\quad}{15}$ .  
 $\frac{2}{3} = \frac{\quad}{15}$ . — fifteenths less — fifteenths are  $\frac{\quad}{15}$ .

5. Multiply 8 by  $6\frac{3}{4}$ . 6 times 8 are —.  $\frac{3}{4}$  of 8  
are —. 48 and 6 are —.

6. Multiply  $9\frac{2}{3}$  by 6. 6 times  $\frac{2}{3}$  are —. 6 times 9  
are —. 4 and 54 are —.

7. Divide  $\frac{1}{4}$  by 3. (Find  $\frac{1}{3}$  of  $\frac{1}{4}$ .)  $\frac{1}{3}$  of  $\frac{1}{4}$  is —.

8. Divide 4 by  $\frac{1}{3}$ . 4 = — thirds.  $\frac{1}{3}$  is contained in  
— thirds — times.

9. Add 3.5 and  $7\frac{3}{8}$ .  $\frac{3}{8} = \frac{\quad}{10}$ . 3.5 and 7.6 are ———.
10.  $\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \text{———}$ . ( $\frac{1}{2} = \frac{\quad}{6}$ .  $\frac{1}{3} = \frac{\quad}{6}$ .)
11.  $\frac{1}{2} + \frac{1}{5} + \frac{1}{10} = \text{———}$ . ( $\frac{1}{2} = \frac{\quad}{10}$ .  $\frac{1}{5} = \frac{\quad}{10}$ .)
12.  $\frac{1}{3} + \frac{1}{5} + \frac{1}{15} = \text{———}$ . ( $\frac{1}{3} = \frac{\quad}{15}$ .  $\frac{1}{5} = \frac{\quad}{15}$ .)
13.  $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \text{———}$ .

DRILL

<i>Add:</i>	<i>Subtract:</i>	<i>Multiply:</i>	<i>Divide:</i>
14.* $249\frac{1}{3}$ $128\frac{1}{2}$ $467\frac{1}{6}$ <u>          </u>	16. 643 $291\frac{3}{5}$ <u>          </u>	19. 54 $6\frac{1}{2}$ <u>          </u>	22. $3 \overline{)642\frac{1}{2}}$
15. $127\frac{3}{4}$ $568\frac{1}{2}$ $270\frac{1}{8}$ $129\frac{5}{8}$ <u>          </u>	17. 892 $543.6$ <u>          </u>	20. 54 $6.5$ <u>          </u>	23. $2 \overline{)736\frac{1}{4}}$
	18. $678\frac{4}{5}$ $129.3$ <u>          </u>	21. 87 $5\frac{1}{3}$ <u>          </u>	24. $4 \overline{)936\frac{1}{2}}$
		25. $5 \overline{)825\frac{1}{2}}$	

*Write, filling out the blanks, and learn:*

One 5 is ———.	Seven 5's are ———.
Two 5's are ———.	Eight 5's are ———.
Three 5's are ———.	Nine 5's are ———.
Four 5's are ———.	Ten 5's are ———.
Five 5's are ———.	Eleven 5's are ———.
Six 5's are ———.	Twelve 5's are ———.

	12ths.		This is inaccurate.
* $249\frac{1}{3}$	$\overline{)4}$	$249\frac{1}{3} = 249\frac{4}{12}$	$249\frac{1}{3} = \frac{4}{3}$
$128\frac{1}{2}$	$\overline{)6}$	or $128\frac{1}{2} = 128\frac{6}{12}$	$128\frac{1}{2} = \frac{6}{2}$
$467\frac{1}{6}$	$\overline{)2}$	$467\frac{1}{6} = 467\frac{2}{6}$	$467\frac{1}{6} = \frac{2}{6}$
<u>845</u>	$\frac{1}{3} = 1$	<u>845</u>	<u>845</u>

## V. PERCENTAGE. REVIEW

1. Name this figure  $D$ .  $A$  is — % of  $D$ .

2.  $B$  is — % of  $D$ .  $C$  is — % of  $D$ .

3.  $C$  is equal to — % of  $A$ .

4. If  $C$  is worth  $\frac{1}{2}$  of a dollar,  $A$  is worth — cents.

5.  $D$  is worth — dollars.

6. If  $D$  represents 640 acres of land,  $A$  represents — acres, and  $B$  represents — acres.

7. 50 % of 640 = —. 10.  $\frac{2}{3}$  of 12 are  $\frac{1}{2}$  of —.

8. 25 % of 640 = —. 11.  $\frac{1}{2}$  of 12 is  $\frac{1}{4}$  of —.

9. 50 % of 320 = —. 12.  $\frac{1}{2}$  of 64 is 4 times —.

13. Call this figure  $H$ .  $E$  is — % of  $H$ .

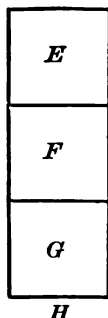
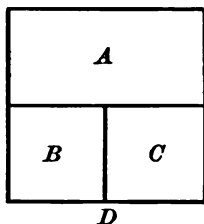
14.  $E$  and  $F$  together are — % of  $H$ .

15. If  $H$  represents 18 acres of land,  $E$  represents — acres.

16.  $E$  and  $F$  together represent — acres.

17.  $33\frac{1}{3}$  % of 18 = —.

18.  $66\frac{2}{3}$  % of 18 = —.



## DRILL

- | Add :  | Subtract :                                  | Multiply :                               | Divide :   |
|--|---|--|--|
| 19. $193\frac{1}{4}$<br>$247\frac{3}{8}$<br><u><math>108\frac{1}{2}</math></u> | 20. 64<br>$8\frac{1}{2}$<br><u>        </u> | 21. $\$342$<br>$2.45$<br><u>        </u> | 22. $\$5675$ by 25.<br>23. $\$37.5$ by 25.<br>24. $\$63.75$ by 25. |

*Write, filling out the blanks, and learn :*

One 6 is —.

Seven 6's are —.

Two 6's are —.

Eight 6's are —.

Three 6's are —.

Nine 6's are —.

Four 6's are —.

Ten 6's are —.

Five 6's are —.

Eleven 6's are —.

Six 6's are —.

Twelve 6's are —.

## VI. COMMON AND DECIMAL FRACTIONS. PROBLEMS

### ORAL

1. At \$200 an acre, how much will 2.34 acres of land cost? 2 acres cost — dollars; 3 tenths of an acre cost — dollars; 4 hundredths of an acre cost — dollars; 2.34 acres cost — dollars.\*

2. John paid \$1.25 for rides at \$.05 each. He took — rides.\*

3.  $$.07 \overline{)$.42}$   $$.07 \overline{)$.84}$   $$.05 \overline{)$.3}$   $$.05 \overline{)$.4}$   $$.05 \overline{)$.3.15}$

4. I paid \$1.60 for 8 yards of cloth. I paid — cents a yard.\*

5.  $$.60 \div 3$        $$1.26 \div 6$        $$3.6 \div 4$        $$7.24 \div 4$

6. If 3 quarts of milk cost 24 cents, 2 quarts will cost — cents.\*

7. If 2 lb. of meat cost 18 cents, 5 pounds will cost — cents.

\* After the oral solution, show the written solution.

## WRITTEN \*

8. At \$327 an acre, how much will 3.25 acres of land cost? †

9. A man spent one year \$18.25 in car fare at \$.05 a ride. How many rides did he take?

10. Mr. Jones's coal bill was \$86.24 for 7 tons of coal. What was the price per ton?

11. Find the cost of 7 cords of wood, when 4 cords cost \$17.40.

12. If 5 tons of coal cost \$28.60, what will 9 tons cost?

13. If 3 tons of hay cost \$42, what will 4.5 tons cost?

## DRILL

<i>Add:</i>	<i>Subtract:</i>	<i>Multiply:</i>	<i>Divide:</i>
14. $62\frac{1}{5}$	16. 586	19. 726	22. $.5)\underline{6.5}$
18.5	$209\frac{5}{7}$	$\underline{4.5}$	23. $5)\underline{6.5}$
24	17. 759	20. 672	24. $.5)\underline{6.}$
$\underline{16}$	$\underline{58\frac{7}{8}}$	$\underline{4.06}$	25. $.7)\underline{14.7}$
15. $19\frac{2}{3}$	18. 600	21. $27\frac{5}{6}$	26. $7)\underline{14.14}$
$6\frac{1}{6}$	$\underline{4\frac{3}{7}}$	$\underline{6.3}$	
$\underline{8\frac{5}{12}}$			

*Write in full, and be able to repeat from memory:*

One 3 is —.

Two 3's are —.

Three 3's are —, etc.

\* If the oral work has been thoroughly mastered, there will be no difficulty with the written work.

† See that the pupil knows that  $3.25 \text{ times } \$327 = 3\frac{1}{4} \text{ times } \$327$ .

## VII. FRACTIONS (Continued)

## ORAL

1. 3 lots of equal size contained 2.37 acres. Each lot contained —.

2.  $3 \overline{)2.96}$  acres     $2 \overline{)17.6}$  acres     $4 \overline{).96}$  acre     $5 \overline{)2.25}$  acres

3. .91 of an acre of land was divided into lots, each containing .07 of an acre. There were — lots.

4. .07 of an acre  $\overline{)2.94}$  acres    .07 of an acre  $\overline{)5.81}$  acres  
       .07 of an acre  $\overline{)14.77}$  acres

5. 5 lots, each containing 1.08 acres, contain — acres in all.

6. 2.03 acres	5.06 acres	7.02 acres
$\underline{\phantom{0}5}$	$\underline{\phantom{0}5}$	$\underline{\phantom{0}4}$
2.35 acres	5.33 acres	
$\underline{\phantom{0}2}$	$\underline{\phantom{0}3}$	

7. The difference of 5.26 acres and 2.06 acres is —.

8. The product of 6.2 acres multiplied by 3 is —.

## WRITTEN \*

9. 4 fields of equal size contained 29.48 acres. How many acres in each?

10. 35.64 acres were divided into lots, each containing .06 of an acre. How many lots were there?

\* Thoroughly master the oral work and there will be no difficulty with the written work.

11. There were 7 lots, each containing 28.9 acres. How many lots were there in all?
12. Find the difference of 72.06 acres and 16.28 acres.
13. Find the product of 65.24 acres multiplied by 8.

## DRILL

- |  |                                |
|--|--------------------------------|
| 14. $6.8 + 4.2 + 16 = *$                             | 22. $8 \times 3\frac{1}{2} =$  |
| 15. $7\frac{1}{2} + 6\frac{3}{4} + 7\frac{3}{8} =$   | 23. $9 \times 4\frac{1}{3} =$  |
| 16. $5\frac{1}{3} + 6\frac{5}{9} + 8\frac{1}{3} =$   | 24. $12 \times 5\frac{2}{3} =$ |
| 17. $17\frac{1}{4} + 4\frac{1}{12} + 6\frac{2}{3} =$ | 25. $16 \times 2\frac{3}{4} =$ |
| 18. $184 - 16\frac{7}{9} =$                          | 26. $\frac{1}{6} \div 2 =$     |
| 19. $27\frac{1}{4} - 8\frac{1}{8} =$                 | 27. $\frac{1}{4} \div 2 =$     |
| 20. $19\frac{5}{8} - 3\frac{1}{4} =$                 | 28. $\frac{1}{6} \div 3 =$     |
| 21. $26\frac{2}{3} - 6\frac{1}{4} =$                 | 29. $\frac{1}{4} \div 2 =$     |

*Write in full, and be able to repeat from memory:*

One 4 is —.

Two 4's are —.

Three 4's are —.

etc.

## VIII. FRACTIONS (Continued)

## ORAL

1. John had \$1.40, which was  $\frac{1}{2}$  as much as his sister had. His sister had —.
2. My knife cost \$50; this is  $\frac{1}{3}$  as much as John's knife cost. John's knife cost —.

\* Write in columns.

3. A ton of hay cost \$24.  $\frac{1}{4}$  of a ton cost —;  $\frac{3}{4}$  of a ton cost —.

4.  $\frac{3}{4}$  of a cord of wood costs \$6.  $\frac{1}{4}$  of a cord of wood costs —.

5. If 2 hats cost \$3, 3 hats cost —.

6. If a ton of hay cost \$20, .2 of a ton will cost —.

7. If an acre is worth \$300, .1 of an acre is worth —; .2 of an acre is worth —; .01 of an acre is worth —; .05 of an acre is worth —.

## WRITTEN \*

8. I spent \$7.54; this sum is  $\frac{1}{2}$  as much as my friend spent. How much did he spend?

9. A boy's coat cost \$7.50; this sum is  $\frac{1}{3}$  as much as his father's coat cost. Find the cost of his father's coat.

10. A certain farm cost \$640.24. What did  $\frac{1}{4}$  of the farm cost?  $\frac{3}{4}$  of it?

11.  $\frac{3}{4}$  of my property is worth \$630.24.  $\frac{1}{4}$  of the property is worth —.

12. If 2 acres are worth \$243.68, 3 acres are worth —.

13. If a ton of fertilizer cost \$40, .2 of a ton will cost —.

14. If an acre is worth \$345, what are .3 of an acre worth?

15. What are .06 of an acre worth?

16. What are 2.15 acres worth?

\* Do not require the written work until the oral work is thoroughly understood.



## DRILL

17.  $7\frac{1}{2} + 6\frac{2}{3} + 7\frac{5}{6} =$

18.  $8.5 + 9.16 + .75 =$

19.  $6\frac{1}{2} + 5.5 + 2.7 =$

20.  $7.5 + \frac{1}{2} + .75 =$

21.  $6.7 - .4 =$

22.  $7\frac{1}{2} - 2.5 =$

23.  $8\frac{3}{4} - 5.5 =$

24.  $7 - 2\frac{5}{7} =$

25.  $\frac{3}{4} \times 2 =$

26.  $\frac{5}{8} \times 3 =$

27.  $16\frac{1}{2} \times 2 =$

28.  $18 \times 2.3 =$

29.  $\$6 \div \$\frac{1}{2} = *$

30.  $\$ \frac{1}{3} \div 2 = *$

31.  $\$16\frac{1}{2} \div 2 = *$

32.  $\$8 \div \$.2 = *$

*Write in full, and be able to repeat from memory :*

One 5 is —.

Two 5's are —.

Three 5's are —.

etc.

## IX. FRACTIONS (Continued)

## ORAL

## WRITTEN

1. Find  $\frac{2}{3}$  of \$2.4 (app. No. 1).

2. \$2.4 is  $\frac{2}{3}$  of what?

3. Find  $\frac{2}{3}$  of \$.12.

4. \$.12 is  $\frac{2}{3}$  of what?

5. Find  $\frac{3}{4}$  of \$2.4.

6. \$2.4 is  $\frac{3}{4}$  of what?

7. Find  $\frac{3}{4}$  of \$.36.

8. \$.36 is  $\frac{3}{4}$  of what?

9. Find  $\frac{2}{3}$  of \$64.8.

10. \$64.8 is  $\frac{2}{3}$  of what?

11. Find  $\frac{2}{3}$  of \$7.14.

12. \$7.14 is  $\frac{2}{3}$  of what?

13. Find  $\frac{3}{4}$  of \$12.48.

14. \$12.48 is  $\frac{3}{4}$  of what?

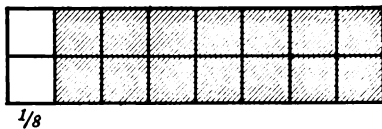
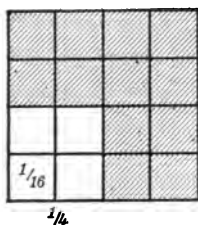
15. Find  $\frac{3}{4}$  of \$6.84.

16. \$6.84 is  $\frac{3}{4}$  of what?

\* If there is hesitation, require a statement of the meaning.

## ORAL

17. One half is — sixteenhs.  
 18. One fourth is — sixteenhs.  
 19. One eighth is — sixteenhs.  
 20. Five eighths are — sixteenhs.



21. One eighth and one sixteenth are — sixteenhs.  
 22. One fourth and one sixteenth are — sixteenhs.  
 23. One eighth less one sixteenth is — sixteenth.  
 24. Five eighths less one sixteenth are — sixteenhs.  
 25.  $\frac{5}{8} + \frac{1}{16} =$     27.  $\frac{3}{16} \times 5 =$     29.  $3 \div \frac{1}{8} =$     31.  $\frac{1}{8} \div 2 =$   
 26.  $\frac{5}{8} - \frac{1}{16} =$     28.  $\frac{3}{8} + \frac{1}{16} =$     30.  $2 + \frac{1}{16} =$     32.  $2 + \frac{1}{4} =$

## DRILL

33.  $6\frac{3}{8} + 5\frac{3}{16} =$     35.  $6\frac{3}{8} - 5\frac{3}{16} =$     37.  $16 \times 3\frac{1}{16} =$   
 34.  $7\frac{1}{16} + 8\frac{5}{8} =$     36.  $18\frac{1}{4} - 2\frac{3}{16} =$     38.  $18\frac{1}{2} \div 2 =$

*Write in full, and be able to repeat from memory :*

One 6 is —.

Two 6's are —.

Three 6's are —, etc.

NOTE. — Pupils should make the drawings.

## X. PRINCIPLES OF SUBTRACTION

## ORAL

1. 16 books	2. \$ 24	3. 21 apples	4. 18
7 books	\$ 14	12 apples	10
<hr/> 9 books	<hr/> \$ 10	<hr/> 9 apples	<hr/> 8

5. In the 1st example "16 books" is called the *minuend*, "7 books" the *subtrahend*, and "9 books" the —.

6. In the 2d example the minuend is —, the subtrahend —, and the difference —.

7. In the 3d example the minuend is —, the subtrahend —, and the difference —.

8. In the 4th example the minuend is —, the subtrahend —, and the difference —.

9. You will observe that the minuend, the subtrahend, and the difference in any example are all like numbers.

10. In an example the minuend is 10 marbles, the subtrahend is 7 marbles, and the difference is — —.

11. If the difference is 4 cents, and the minuend is 9 cents, the subtrahend is — —.

12. If the difference is \$6, and the subtrahend is \$5, the minuend is — —.

13. The difference of two numbers is 3, the smaller is 7, and the larger is —.

14. The sum of two numbers is 13, and one of the numbers is 7; the other number is —.

15. From the sum of 8 and 6 subtract their difference.

WRITTEN

- |                                 |                               |                              |
|---------------------------------|-------------------------------|------------------------------|
| 16. $146\frac{1}{2} \times 4 =$ | 20. $3 \overline{)62.4}$      | 24. $.08 \overline{)12.}$    |
| 17. $90\frac{1}{4} \times 6 =$  | 21. $\$.3 \overline{)\$12.6}$ | 25. $.05 \overline{)13.}$    |
| 18. $17\frac{3}{5} \times 6 =$  | 22. $.5 \overline{)6.}$       | 26. $.05 \overline{)14.75}$  |
| 19. $28 \times 4\frac{3}{4} =$  | 23. $.07 \overline{)84.21}$   | 27. $\$.04 \overline{)\$3.}$ |

*Write, filling out the blanks, and learn :*

- |                    |                     |
|--------------------|---------------------|
| One 7 is ———.      | Seven 7's are ———.  |
| Two 7's are ———.   | Eight 7's are ———.  |
| Three 7's are ———. | Nine 7's are ———.   |
| Four 7's are ———.  | Ten 7's are ———.    |
| Five 7's are ———.  | Eleven 7's are ———. |
| Six 7's are ———.   | Twelve 7's are ———. |

XI. AREA OF RECTANGLES

ORAL

1. The area of a rectangle 1 inch wide and 4 inches long is ——— square inches. The area of a rectangle  $\frac{1}{2}$  of an inch wide and 4 inches long is ——— square inches.
2. Draw a 1-inch square. Draw a rectangle 1 inch by  $\frac{1}{4}$  of an inch. The 1-inch square is equal to ——— rectangles of the size you have drawn.
3. The area of a rectangle  $\frac{1}{4}$  of an inch wide and 8 inches long is ——— square inches.
4. The area of a rectangle 1 inch wide and 3 inches long is ——— square inches.

5. The area of a rectangle  $\frac{1}{2}$  of an inch wide and 3 inches long is — square inches.

6. The area of a rectangle 1 inch wide and 5 inches long is — square inches.

7. The area of a rectangle 2 inches by 4 inches is — square inches.

8. The area of a rectangle  $2\frac{1}{2}$  inches by 4 inches is — square inches.

9. The area of a rectangle 1 foot by 6 inches is — of a square foot.

10. The area of a rectangle 2 feet by 6 inches is — square foot.

11. The area of a rectangle 3 feet by 6 inches is — square feet.

12. The area of a rectangle 2 feet by  $1\frac{1}{2}$  feet is — square feet.

13. The area of a rectangle 6 feet by  $2\frac{1}{2}$  feet is — square feet.

14. A 2-inch square is — square inches.

15. A 1-inch square is — square inch.

16. A  $\frac{1}{2}$ -inch square is — — of a square inch.

17. A  $\frac{1}{2}$ -foot square is — — of a square foot.

## WRITTEN

Add:

$$\begin{array}{r} 18. \quad 16.5 \\ \quad 4\frac{1}{2} \\ \quad 5\frac{3}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 19. \quad 8\frac{1}{4} \\ \quad 16\frac{3}{8} \\ \quad 5\frac{3}{16} \\ \hline \end{array}$$

$$\begin{array}{r} 20. \quad 27\frac{1}{8} \\ \quad 9\frac{3}{16} \\ \quad 7\frac{7}{16} \\ \hline \end{array}$$

*Subtract :*

$$\begin{array}{r} 21. \quad 84\frac{1}{3} * \\ \underline{2\frac{2}{3}} \end{array}$$

$$\begin{array}{r} 22. \quad 96\frac{1}{4} \dagger \\ \underline{4\frac{3}{4}} \end{array}$$

$$\begin{array}{r} 23. \quad 86.5 \\ \underline{4.25} \end{array}$$

$$\begin{array}{r} 24. \quad 15\frac{3}{4} \\ \underline{6\frac{1}{2}} \end{array}$$

*Multiply :*

$$\begin{array}{r} 25. \quad 48 \\ \underline{2.5} \end{array}$$

$$\begin{array}{r} 26. \quad 68 \\ \underline{.34} \end{array}$$

$$\begin{array}{r} 27. \quad 675 \\ \underline{.13} \end{array}$$

$$\begin{array}{r} 28. \quad 18.4 \\ \underline{23} \end{array}$$

*Write, filling out the blanks, and learn :*

One 8 is ———.

Two 8's are ———.

Three 8's are ———.

Four 8's are ———.

Five 8's are ———.

Six 8's are ———.

Seven 8's are ———.

Eight 8's are ———.

Nine 8's are ———.

Ten 8's are ———.

Eleven 8's are ———.

Twelve 8's are ———.

## XII. PRINCIPLES OF MULTIPLICATION

### ORAL

$$\begin{array}{r} 1. \quad 12 \text{ books} \\ \underline{4} \\ 48 \text{ books} \end{array}$$

$$\begin{array}{r} 2. \quad \$20 \\ \underline{3} \\ \$60 \end{array}$$

$$\begin{array}{r} 3. \quad 8 \text{ apples} \\ \underline{6} \\ 48 \text{ apples} \end{array}$$

$$\begin{array}{r} 4. \quad 6 \\ \underline{5} \\ 30 \end{array}$$

5. In the 1st example "12 books" is called the multiplicand, 4 is called the multiplier, and "48 books" is called the ———.

6. In the 2d example \$60 is the ———, \$20 is the ———, and 3 is the ———.

7. In the 3d example 6 is the ———, 48 apples is the ———, and 6 is the ———.

\* Take 1 from 4 and calling it  $\frac{3}{4}$  add it to  $\frac{1}{3}$ . Then subtract  $\frac{3}{4}$  from  $\frac{4}{3}$ .

† Taking 1 from 6, call it  $\frac{5}{4}$  and add it to  $\frac{1}{4}$ . Then subtract  $\frac{5}{4}$  from  $\frac{5}{4}$ .

8. In the 4th example 6 is the —, 5 is the —, and 30 is the —.

9. In an example 12 is the product, 3 is the multiplier, and — is the multiplicand.

10. In an example \$15 is the multiplicand, 2 is the multiplier, and — dollars is the product.

11. The product of two numbers is \$18, the multiplier is 3, and the multiplicand is —.

12. If the multiplicand is 9 inches and the multiplier is 4, the product is —.

13. If the product of two numbers is 24 and one of the numbers is 8, the other number is —.

14. You will observe that the multiplicand and product are always *like* numbers. If the multiplicand is dollars, the product is —.

15. The multiplier is never inches, or pencils, or dimes, or cents. It simply shows how many times to take the multiplicand. In 8 times \$3, 8 is the —, and shows how many times to take \$3.

#### WRITTEN

16.  $8\frac{1}{2}$  books  $\times 4 =$

19.  $198\frac{1}{2} \div 2 =$

17. 9 bushels  $\times 2\frac{2}{3} =$

20.  $\$184\frac{1}{4} \div 4 =$

18. 63 trees  $\times 2\frac{2}{3} =$

21.  $\$ \frac{3}{5} + \$ \frac{2}{15} =$

*Write, filling out the blanks, and learn :*

One 9 is —.

Three 9's are —.

Two 9's are —.

Four 9's are —.

- |                  |                   |
|------------------|-------------------|
| Five 9's are —.  | Nine 9's are —.   |
| Six 9's are —.   | Ten 9's are —.    |
| Seven 9's are —. | Eleven 9's are —. |
| Eight 9's are —. | Twelve 9's are —. |

### XIII. ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION OF COMPOUND DENOMINATE NUMBERS

#### ORAL

1. 3 qt. 1 pt. + 1 qt. 1 pt. are —.
2. 2 gal. 3 qt. + 3 gal. 2 qt. are —.
3. 1 bu. 2 pk. + 2 bu. 3 pk. are —.
4. 3 qt. 1 pt. - 2 qt. 1 pt. are —.
5. 3 gal. 2 qt. - 1 gal. 3 qt. are —.
6. 4 bu. 2 pk. - 1 bu. 3 pk. are —.
7. 2 gal. 3 qt.  $\times$  3 = —.
8. 2 bu. 2 pk.  $\times$  2 = —.
9. 3 qt. 1 pt.  $\div$  2 pt. = —.
10. 6 bu. 2 pk.  $\div$  2 = —.

#### WRITTEN

11. 4 qt. 1 pt. + 7 qt. 1 pt. = —.\*
12. Add 7 gal. 3 qt. and 17 gal. 2 qt.
13. Add 23 bu. 3 pk. and 16 bu. 5 pk.

	qt.	pt.
* FORM.	4	1
	7	1
	<hr/>	<hr/>
	12	0



14. From 6 qt. 1 pt. subtract 4 qt. 1 pt.
15. From 25 gal. 2 qt. subtract 13 gal. 3 qt.
16. From 28 bu. 2 pk. subtract 9 bu. 3 pk.
17. Multiply 13 bu. 2 pk. by 7.
18. Multiply 12 gal. 3 qt. by 8.
19. Divide 14 bu. 3 pk. by 3 pk.
20. Divide 18 bu. 2 pk. by 2.
21. Add 6 ft. 8 in. and 9 ft. 5 in.
22. From 17 ft. 10 in. subtract 8 ft. 11 in.
23. Multiply 9 ft. 3 in. by 7.
24. Divide 5 ft. 6 in. by 8 in.

*Write in full, and be able to repeat from memory:*

One 7 is —.

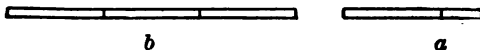
Two 7's are —.

Three 7's are —.

etc.

#### XIV. A STUDY IN RATIO, $\frac{2}{3}$

##### ORAL



1.  $b$  is equal to — halves of  $a$ .
2.  $a$  is equal to — — of  $b$ .
3. If  $b$  represents 15 inches,  $a$  represents — inches.
4.  $\frac{2}{3}$  of 15 inches are — inches.

5. If  $b$  represents 21 miles,  $a$  represents — miles.
6.  $\frac{2}{3}$  of 21 miles are — miles.
7. If  $a$  represents 18 inches,  $b$  represents — inches.
8.  $\frac{3}{2}$  of 18 inches are — inches.
9. If  $a$  represents 24 yards,  $b$  represents — yards.
10. 12 is — — of 18. 18 is — — of 12.
11. 6 is — — of 9. 9 is — — of 6.
12. 16 is — — of 24. 24 is — — of 16.
13. 2.3 is — — of 6.9. 6.9 is — times 2.3.
14. 9 months are — — of 6 months, or — and — — times 6 months. A man who earns \$60 in 6 months will earn in 9 months — and — — times \$60, or — dollars.
15. If 6 lemons cost 10 cents, 9 lemons will cost — cents.
16. If 4 oranges cost 18 cents, 6 oranges will cost — cents.
17. If 12 eggs cost 15 cents, 8 eggs will cost — cents.
18. If a train goes 60 miles in 3 hours, in 2 hours it will go — miles.
19.  $\frac{2}{3}$  of 18 and  $\frac{3}{4}$  of 16 are —.
20.  $\frac{2}{3}$  of 21 is  $\frac{7}{2}$  of —.
21.  $\$9 \times 1\frac{1}{2} = \$9 \times 2\frac{1}{2} =$
22.  $\$8 \times 1\frac{1}{4} = \$8 \times 2\frac{1}{4} =$
23.  $\$16 \div \$\frac{1}{2} = \$16 \div 2 =$

24.  $\frac{2}{3}$  of \$15 = \$18 are  $\frac{2}{3}$  of — dollars.
25.  $\frac{1}{3}$  of \$84 = \$84 are  $\frac{1}{3}$  of —.
26.  $\frac{2}{3}$  of \$18 = \$18 are  $\frac{2}{3}$  of —.
27.  $\frac{2}{3}$  of \$6 = \$6 are  $\frac{2}{3}$  of —.
28.  $\frac{2}{3}$  of \$24 = \$24 are  $\frac{2}{3}$  of —.
29.  $\frac{2}{3}$  of \$30 = \$30 are  $\frac{2}{3}$  of —.
30.  $\frac{3}{2}$  of \$18 = \$18 are  $\frac{3}{2}$  of —.

*Write in full, and be able to repeat from memory :*

One 8 is —.

Two 8's are —.

Three 8's are —.

etc.

NOTE. — The pupils should draw lines  $a$  and  $b$ , making their relative lengths correct. This lesson and Lessons 15–17 treat of a type of relations that should be thoroughly mastered.

## XV. THREE FOURTHS

ORAL



1.  $a$  is equal to — fourths of  $b$ .
2.  $b$  is equal to — thirds of  $a$ .
3. If  $b$  represents 12 square feet,  $a$  represents — square feet.
4. If  $a$  represents 12 square feet,  $b$  represents — square feet.

5. 12 is — of 16. 16 is — of 12.
6. 9 is — of 12. 12 is — of 9.
7. \$15 are — of \$20. \$20 are — of \$15.
8. 6 inches are — of 8 inches. 8 inches are — of 6 inches.
9. 1.8 are — of 2.4. 2.4 are — of 1.8.
10. 2.4 are — of 3.2. 3.2 are — of 2.4.
11. 16 is — of 12, or — and — times  
12. A man who earns \$4 in 12 hours will earn — and — times \$4 in 16 hours. In 16 hours he will earn — dollars.
12. 28 is — of 21. For \$21 I can buy 9 barrels of apples. For \$28 I can buy — barrels.
13. 8 is — and — times 6. For \$6 I can buy 12 pounds of candy. For \$8 I can buy — and — times 12 pounds, or — pounds.
14. 8 is  $\frac{2}{3}$  of —.  $\frac{2}{3}$  of 12 are —.
15.  $\frac{3}{4}$  of 24 are —. 24 is  $\frac{3}{4}$  of —.
16.  $\frac{2}{3}$  of 18 are —. 18 is  $\frac{2}{3}$  of —.
17.  $\frac{3}{4}$  of 12 are —. 12 is  $\frac{3}{4}$  of —.
18.  $\frac{2}{3}$  of 30 are —. 30 is  $\frac{2}{3}$  of —.

*Write in full, and be able to repeat from memory :*

One 9 is —.

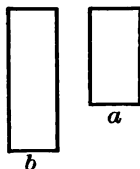
Two 9's are —.

Three 9's are —, etc.

## XVI. TWO THIRDS

## ORAL

1.  $a$  is equal to — thirds of  $b$ .  $b$  is equal to — halves of  $a$ .



2. If  $b$  represents one acre of land,  $a$  represents — of an acre.

3. If  $b$  represents 3 acres of land,  $a$  represents — acres.

4. If  $b$  represents 6 acres of land,  $a$  represents — acres.

5. If  $a$  represents 1 acre,  $b$  represents — and — acres.

6. If  $a$  represents 3 acres,  $b$  represents — and — acres.

7. If  $a$  represents 4 acres,  $b$  represents — acres.

8. If  $a$  is worth \$30,  $b$  is worth —.

9. If  $a$  is worth \$18,  $b$  is worth —.

10. 18 is — of 27. If 27 lb. of nails cost 81 cents, 18 lb. will cost — of 81 cents, or — cents.

11. 27 is — and — times 18. If 18 lb. of oats are worth 24 cents, 27 lb. are worth — and — times 24 cents, or — cents.

12. 20 is — of 30. 30 is — of 20, or — and — times 20.

13. 22 is — of 33. 33 is — of 22, or — and — times 22.

14. If in 30 days a man earns \$24, in 20 days he will earn —.

15. If in 20 days a man travels 400 miles, in 30 days he will travel — miles.

16. If in 33 days a man earns \$39, in 22 days he will earn —.

17. If in 22 days a man travels 200 miles, in 33 days he will travel — miles.

18.  $\frac{2}{3}$  of 18 = 18 is  $\frac{2}{3}$  of —.

19.  $\frac{2}{3}$  of \$30 = \$30 are  $\frac{2}{3}$  of —.

## WRITTEN

20. Find  $\frac{2}{3}$  of 840.

21. 840 is  $\frac{2}{3}$  of what number?

22. Find  $\frac{2}{3}$  of \$960.

23. \$960 are  $\frac{2}{3}$  of what number?

24. Find  $\frac{2}{3}$  of 108 barrels.

25. 108 barrels are  $\frac{2}{3}$  of how many barrels?

26. I have \$720. John has  $\frac{2}{3}$  as much. How much has he?

*Write, filling out the blanks, and learn:*

One 10 is —. Seven 10's are —.

Two 10's are —. Eight 10's are —.

Three 10's are —. Nine 10's are —.

Four 10's are —. Ten 10's are —.

Five 10's are —. Eleven 10's are —.

Six 10's are —. Twelve 10's are —.

NOTE. — Have pupils draw rectangles *a* and *b*.

## XVII. THREE FOURTHS

## ORAL

1.  $a$  is equal to — fourths of  $b$ .  $b$  is equal to — thirds of  $a$ .

2. If  $b$  represents 1 mile,  $a$  represents — — of a mile.

3. If  $b$  represents 2 miles,  $a$  represents — and — — miles.

4. If  $b$  represents 3 miles,  $a$  represents — and — — miles.

5. If  $b$  represents 4 miles,  $a$  represents — miles.

6. If  $b$  represents 5 miles,  $a$  represents — and — — miles.

7. If  $b$  represents 8 miles,  $a$  represents — miles.

8. If  $a$  represents 1 mile,  $b$  represents — and — — miles.

9. If  $a$  represents 2 miles,  $b$  represents — and — — miles.

10. If  $a$  represents 3 miles,  $b$  represents — miles.

11. If  $a$  represents 4 miles,  $b$  represents — and — — miles.

12. If  $a$  represents 5 miles,  $b$  represents — and — — miles.

13. If  $a$  represents 6 miles,  $b$  represents — miles.

14. 15 is — — of 20. 20 is — — of 15, or — and — — times 15.



15. 18 is — of 24. 24 is — of 18, or — and — times 18.

16. When 20 yd. of silk cost \$ 16, 15 yd. will cost — of \$ 16, or —.

17. When 15 lb. of sugar cost 60 cents, 20 lb. will cost — and — times 60¢, or —.

18. If 24 rods of fence cost \$ 28, 18 rods will cost — of \$ 28, or —.

19. If 18 marbles cost 15¢, 24 marbles will cost — and — times 15¢, or —.

## WRITTEN

20. Find  $\frac{3}{4}$  of \$ 384.

24. Find  $\frac{3}{4}$  of 73.2.

21. \$ 384 are  $\frac{3}{4}$  of what?

25. 73.2 are  $\frac{3}{4}$  of what?

22. Find  $\frac{3}{4}$  of 876 yd.

26. Find  $\frac{3}{4}$  of \$  $\frac{8}{9}$ .

23. 876 yd. are  $\frac{3}{4}$  of what?

27. \$  $\frac{6}{10}$  are  $\frac{3}{4}$  of what?

28. An express train ran 960 miles in one day. A freight train ran  $\frac{3}{4}$  as far. How far did the latter go?

29. One farmer sold his wheat for 72¢ a bushel, but this price was only  $\frac{3}{4}$  as much as another farmer received for his. How much did the second farmer receive?

*Write, filling out the blanks, and learn :*

One 11 is —.

Seven 11's are —.

Two 11's are —.

Eight 11's are —.

Three 11's are —.

Nine 11's are —.

Four 11's are —.

Ten 11's are —.

Five 11's are —.

Eleven 11's are —.

Six 11's are —.

Twelve 11's are —.



## XVIII. PRINCIPLES OF DIVISION

$$\begin{array}{r} 1. \quad 8 \text{ qt. } \overline{)24 \text{ qt.}} \\ \quad \quad \quad 3 \text{ times} \end{array}$$

$$\begin{array}{r} 3. \quad 7 \text{ bu. } \overline{)28 \text{ bu.}} \\ \quad \quad \quad 4 \text{ times} \end{array}$$

$$\begin{array}{r} 2. \quad 4 \overline{)\$20} \\ \quad \quad \quad \$5 \end{array}$$

$$\begin{array}{r} 4. \quad 5 \overline{)40 \text{ pk.}} \\ \quad \quad \quad 8 \text{ pk.} \end{array}$$

5. In the first example the divisor is —, the dividend is —, and the quotient is —.

6. In the second example the quotient is —, the divisor is —, and the dividend is —.

7. In the third example the dividend is —, the divisor is —, and the quotient is —.

8. In the first example the — and the — are like numbers.

9. In the second example the — and the — are like numbers.

10. In the third example the — and the — are like numbers.

11. In the fourth example the — and the — are like numbers.

12. In an example the divisor is 6 qt. and the quotient is 5. The dividend is —.

13. In an example the divisor is 4 and the quotient is 7 books. The dividend is —.

14. 4 is contained in 8 — times. 2 is contained in 8 — times. 1 is contained in 8 — times.  $\frac{1}{2}$  is contained in 8 — times.  $\frac{1}{4}$  is contained in 8 — times.

$$15. \quad 36 \div 2 = \quad 36 \div 1 = \quad 36 \div \frac{1}{2} = \quad 36 \div \frac{1}{3} =$$

16. When the divisor is more than 1, the quotient number is — than the dividend number. When the divisor is 1, the quotient number is equal to the dividend number. When the divisor is less than 1, the quotient number is — than the dividend number.

WRITTEN

17.  $\$32 \overline{) \$896}$

19.  $27 \overline{) \$945}$

21.  $2.9 \overline{) 702}$

18.  $\$26 \overline{) \$1898}$

20.  $28 \overline{) \$2408}$

22.  $3.1 \overline{) 195.3}$

*Write, filling out the blanks, and learn :*

One 12 is —.

Seven 12's are —.

Two 12's are —.

Eight 12's are —.

Three 12's are —.

Nine 12's are —.

Four 12's are —.

Ten 12's are —.

Five 12's are —.

Eleven 12's are —.

Six 12's are —.

Twelve 12's are —.

**XIX. ODD AND EVEN NUMBERS**

ORAL

1. 5 is an exact divisor of 5, of 10, of 15, of —, and of —.

2. 2 is an exact divisor of 2, of 4, of 6, of —, and of —.

3. 3 is an exact divisor of 3, of 6, of 9, of —, and of —.

4. 12 is exactly divisible by 2, by —, and by —.

5. 15 is exactly divisible by — and by —.

6. 21 is exactly divisible by — and by —.

7. All numbers which are exactly divisible by 2 are called *even* numbers.

8. 2, 4, 10, 12, —, —, and — are even numbers.

9. 1, 3, 5, 7, 9, —, —, and — are not exactly divisible by 2.

10. All numbers which are not exactly divisible by 2 are called *odd* numbers. 11, 13, —, —, and — are odd numbers.

11. 21 is an — number. 26 is an — number.

12. 18 is an — number. 23 is an — number.

13. The odd numbers under 20 are —.

14. The even numbers under 19 are —.

15. 2 is an exact divisor of any number whose right-hand figure is 0, 2, 4, 6, or 8. A number ending in 0, 2, 4, 6, or 8 is an — number.

#### WRITTEN

16. Find the sum of the odd numbers from 1 to 19 inclusive.

17. Find the sum of the even numbers from 2 to 18 inclusive.

18. Add the odd numbers in this list: 69, 128, 84, 139, 74, 93, 75.

19. Add the even numbers in this list: 38, 63, 73, 88, 79, 126, 49.

20. Make a list of the numbers from 100 to 120 inclusive which are exactly divisible by 2.

21. Divide \$2460 by 30.      22. Divide \$24.60 by 30.

*Write in full, and be able to repeat from memory :*

One 12 is —.

Two 12's are —.

Three 12's are —.

etc.

## XX. PRIME AND COMPOSITE NUMBERS

### ORAL

1. 1 and 7 are the only whole numbers that will exactly divide 7. — and — are the only whole numbers that will exactly divide 5.

2. — and — are the only whole numbers that will exactly divide 11.

3. The only whole numbers that will exactly divide 13 are — and —.

4. A number which has no whole number for an exact divisor besides itself and 1 is a *prime* number. All other whole numbers are *composite*.

5. 6 is a — number. 9 is a — number.

6. 3 is a — number. 4 is a — number.

7. 8 is a — number. 10 is a — number.

8. 14 is a — number. 15 is a — number.

9. 17 is a — number. 21 is a — number.

10. 23 is a ——— number. 25 is a ——— number.
11. All even numbers, except 2, are ———.
12. The odd numbers 1, 3, 5, 7, 11, 13, 17, 19, and 23 are ———.
13. The odd numbers 9, 15, 21, and 25 are ———.

## WRITTEN

14. Find the sum of the prime numbers from 1 to 31 inclusive.
15. Find the sum of the prime numbers from 31 to 59 inclusive.
16. Find the sum of the first ten composite numbers.
17. Divide \$5394 by 31.      21. From 645 take  $69\frac{5}{7}$ .
18. Divide \$53.94 by 31.      22. Multiply  $842\frac{1}{2}$  by 46.
19. Divide \$6786 by 29.      23. From  $967\frac{3}{4}$  take 89.
20. Divide \$67.86 by 29.      24. Multiply 74 by  $27\frac{1}{2}$ .

*Learn to read without hesitation, supplying the omissions :*

Six 6's are ———.

Eight 6's are ———.

Six 7's are ———.

Eight 7's are ———.

Six 8's are ———.

Eight 8's are ———.

Six 9's are ———.

Eight 9's are ———.

Seven 6's are ———.

Nine 6's are ———.

Seven 7's are ———.

Nine 7's are ———.

Seven 8's are ———.

Nine 8's are ———.

Seven 9's are ———.

Nine 9's are ———.

(1) First read down ; then read across.

## XXI. PRIME FACTORS

## ORAL

1. — and — will exactly divide 15. — and — will exactly divide 21. Exact divisors are called factors.

2. 3 and 11 are factors of —.

3. 5 and 7 are factors of —.

4. 5 and 4 are factors of —. 5 is a *prime* factor of 20. 4 is a *composite* factor of 20.

A factor which is a prime number is called a *prime* factor.

A factor which is a composite number is called a *composite* factor.

5. 6 is — factor of 12. 7 is a — factor of 14.

6. 9 is — factor of 18. 11 is a — factor of 22.

7. 5 is — factor of 30. 10 is a — factor of 30.

8. The prime factors of 6 are — and —.

9. The prime factors of 12 are 2, 2, and 3.

10. The product of 2, 2, and 3 is —.

11. The prime factors of 18 are 2, 3, and 3.

12. The product of 2, 3, and 3 is —.

13. A number is equal to the product of its prime factors.

14. 2, 3, and 5 are the prime factors of —.

15. 3, 5, and 7 are the prime factors of —.

16. The prime factors of 9 are — and —.

17. The prime factors of 28 are —, —, and —.

18. 
$$\begin{array}{r|l} 2 & 36 \\ & 18 \\ 3 & 9 \\ & 3 \end{array}$$
 The prime factors of 36 are 2, 2, 3, and 3.  
 $2 \times 2 \times 3 \times 3 = \text{---}$ .

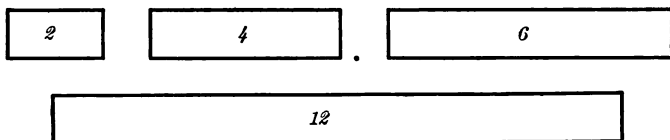
19. 
$$\begin{array}{r|l} 2 & 42 \\ 3 & 21 \\ & 7 \end{array}$$
 The prime factors of 42 are 2, 3, and 7.  
 $2 \times 3 \times 7 = \text{---}$ .

## WRITTEN

20. Find the prime factors of 38.  
 21. Find the prime factors of 54.  
 22. Of 45.                      26. Of 136.                      29. Of 105.  
 23. Of 63.                      27. Of 86.                      30. Of 102.  
 24. Of 95.                      28. Of 91.                      31. Of 87.  
 25. Of 140.                      32. Divide 2345 bu. by 35 bu.  
 33. Multiply 309 bu. by 38.  
 34. Divide \$94.64 by \$.52.

## XXII. FACTORS AND MULTIPLES

## ORAL



1. 2 is contained in 4 — times, in 6 — times, and in 12 — times.  
 2. 2 is an exact divisor of —, —, and —.

3. 4 is an exact divisor of —.
4. 6 is an exact divisor of —.
5. 4 is a multiple of 2.
6. 6 and 12 are also multiples of —.
7. 12 is a common multiple of —, —, and —.
8. One foot is a common multiple of — inches, — inches, — inches, and — inches.
9. One peck (8 quarts) is a common multiple of — quarts and — quarts.
10. One pound is a common multiple of — ounces, — ounces, and — ounces.
11. 20 is — 4's. 20 is — 2's.
12. There are twice as many 2's as 4's in a number.
13. 18 is — 6's. 18 is — 3's.
14. There are twice as many 3's as 6's in a number.
15. 60 is — 10's. 60 is — 5's.
16. There are — as many 5's as 10's in a number.

## WRITTEN

- |                           |                       |
|---------------------------|-----------------------|
| 17. How many 4's in 684 ? | 21. $6946 \div 23$ .  |
| 18. How many 2's in 684 ? | 22. $14145 \div 69$ . |
| 19. How many 6's in 756 ? | 23. $14214 \div 69$ . |
| 20. How many 3's in 756 ? | 24. $14223 \div 69$ . |



## XXIII

## ORAL

1. Two, 4, 6, 8, 10, 12, etc., are multiples of 2.  
 2. Three, 6, 9, 12, 15, 18, etc., are multiples of 3.

3. Four, 8, 12, 16, 20, 24, etc., are multiples of 4.

4. The *common* multiple of 2, 3, and 4 found in the three lists just given is —. (The number in all three lists.)

5. The next *common* multiple of 2, 3, and 4 is —.

6. Six is a *common* multiple of — and —.

7. Twelve is a *common* multiple of 2, —, —, and 6.

8. Common multiples of 2 and 5 are 10, —, —, —, etc.

9. The *least common multiple* of 2 and 5 is —.

10. Common multiples of 4 and 8 are 8, —, —, 32, —, etc.

11. The least common multiple of 4 and 8 is —.

12. Common multiples of 2 and 3 are 6, —, —, 24, —, etc.

13. The least common multiple of 2 and 3 is —.

a b c

14. Common multiples of 3 and 5 are —, —, —, etc.
15. The least common multiple of 3 and 5 is —.
16.  $a$  is — inches long.  $b$  is — inches long.  $c$  is — inches long.
17.  $a$  is an exact divisor of —.
18.  $b$  is an exact divisor of —.
19.  $c$  is a common multiple of — and —.
20. 24 bushels is a common multiple of 3 bu., — bu., — bu., 8 bu., and — bu.
21. The prime factors of 36 are —, —, —, and —.

WRITTEN

22. Find the prime factors of 72.
23. Of 40.
26.  $257 \times 34$ .
29.  $8820 \text{ gal.} \div 36$ .
24. Of 48.
27.  $89 \text{ lb.} \times 16$ .
30.  $8820 \text{ gal.} \div 3.6$ .
25. Of 56.
28.  $74 \text{ bu.} \times 73$ .
31.  $8575 \text{ qt.} \div 35$ .

XXIV. REVIEW

ORAL

1. Prime factors of a number are factors which are — numbers.\*
2. Composite factors of a number are factors which are — numbers.\*
3. The prime factors of 30 are —, —, and —.

\* Lesson 21, Ex. 4.

4. The composite factors of 18 are — and —.
5. The prime factors of 70 are —, —, and —.
6. The composite factors of 70 are —, —, and —.
7. Common multiples of 2, 3, and 5 are —, —, etc.
8. The least common multiple of 2, 3, and 5 is —.
9. Common multiples of 2, 3, and 7 are —, —, etc.
10. The least common multiple of 2, 3, and 7 is —.
11. Common multiples of 2, 5, and 7 are —, —, —, etc.
12. The least common multiple of 2, 5, and 7 is —.
13. Common multiples of 2, 3, and 11 are —, —, —, etc.
14. The least common multiple of 2, 3, and 11 is —.
15. All even numbers except 2 are —.
16. Two is the only even number which is —.

## WRITTEN

17. Find the sum of the first 12 odd numbers.
18. Find the sum of the first 12 even numbers.
19. 3, 5, and 13 are the prime factors of —.
20. 7, 11, and 13 are the prime factors of —.
21. 3, 11, and 17 are the prime factors of —.

*Find the prime factors of:*

22. 28; 36; 51.    23. 57; 58; 64.    24. 65; 135; 175.

*Multiply :*

25. 204 by 36.

26. 305 by 47.

27. 406 by 58.

28. 423 by 9.

*Divide :*

29. 7344 lb. by 36 lb.

30. 10335 lb. by 47 lb.

31. 23548 lb. by 58 lb.

32. 3807 qt. by 9.

**XXV. COMMON FRACTIONS. COMMON DENOMINATOR**

## ORAL

1.  $\frac{3}{8}$ ,  $\frac{4}{8}$ ,  $\frac{5}{8}$ , and  $\frac{7}{8}$  are fractions with a *common denominator*.

2. The fractions  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $\frac{7}{8}$ , and  $\frac{9}{10}$  have not a common —.

3. Change  $\frac{1}{2}$ ,  $\frac{2}{3}$ , and  $\frac{3}{4}$  to fractions having a common denominator. The denominators of these fractions are —, —, and —. The least common multiple of 2, 3, and 4 is —. Change these fractions to —ths.  
 $\frac{1}{2} = \frac{\quad}{12}$ .  $\frac{2}{3} = \frac{\quad}{12}$ .  $\frac{3}{4} = \frac{\quad}{12}$ .

4. Add  $\frac{2}{3}$  and  $\frac{3}{5}$ . The least common multiple of the denominators is —. Change the fractions to —ths.  
 $\frac{2}{3} = \frac{\quad}{15}$ .  $\frac{3}{5} = \frac{\quad}{15}$ . — fifteenths and — fifteenths are — fifteenths, or — and — fifteenths.

$$\frac{2}{3} + \frac{3}{5} = \frac{\quad}{15} + \frac{\quad}{15} = \frac{\quad}{15} = \frac{\quad}{15}.$$

5. From  $\frac{3}{4}$  take  $\frac{3}{5}$ . The l. c. m. (least common multiple) of the denominators is —. Change the fractions to —ths.  $\frac{3}{4} = \frac{\quad}{20}$ .  $\frac{3}{5} = \frac{\quad}{20}$ . — twentieths less — twentieths are — twentieths.

$$6. 2\frac{3}{4} \times 2 = \text{—}. \quad 3\frac{2}{3} \times 3 = \text{—}. \quad 4\frac{1}{2} \times 4 = \text{—}.$$

## WRITTEN

- |   |                                      |                                 |
|---|--------------------------------------|---------------------------------|
| 7. $\frac{3}{4} + \frac{1}{9} = *$          | 14. $\frac{7}{8} - \frac{2}{3} =$    | 21. $48 \times 47\frac{3}{4} =$ |
| 8. $\frac{5}{6} + \frac{2}{5} =$            | 15. $24\frac{3}{4} - 7\frac{1}{9} =$ | 22. $26\frac{1}{2} \div 2 =$    |
| 9. $\frac{7}{8} + \frac{2}{3} =$            | 16. $29\frac{5}{6} - 8\frac{2}{5} =$ | 23. $84\frac{1}{3} \div 4 =$    |
| 10. $4\frac{3}{4} + 2\frac{1}{9} = \dagger$ | 17. $64\frac{2}{3} \times 15 =$      | 24. $96\frac{1}{5} \div 4 =$    |
| 11. $15\frac{5}{6} + 18\frac{2}{5} =$       | 18. $85\frac{5}{6} \times 24 =$      | 25. $85\frac{1}{2} \div 5 =$    |
| 12. $\frac{3}{4} - \frac{1}{9} =$           | 19. $48 \times 29\frac{1}{2} =$      | 26. $2494 \div \frac{1}{5} =$   |
| 13. $\frac{5}{6} - \frac{2}{5} =$           | 20. $48 \times 38\frac{2}{3} =$      | 27. $74 \div \frac{1}{6} =$     |

## XXVI. REDUCTION OF PROPER AND IMPROPER FRACTIONS

## ORAL

1.  $\frac{4}{8} = \frac{1}{2}$ .  $\frac{6}{12} = \frac{1}{2}$ .  $\frac{1}{2}$  is  $\frac{4}{8}$  reduced to its lowest terms.  $\frac{1}{2}$  is  $\frac{6}{12}$  reduced to its lowest terms.

2.  $\frac{6}{8}$  reduced to its lowest terms equals  $\frac{3}{4}$ . The terms of  $\frac{6}{8}$  are the 6 and the 8, the numerator and the denominator.

3.  $\frac{8}{12}$  reduced to its lowest terms equals  $\frac{2}{3}$ . The terms of  $\frac{8}{12}$  are the — and the —.

4. The terms of a fraction are its — and its —.

*Reduce to lowest terms :*

- |                      |                   |                   |                   |                   |                   |
|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 5. $\frac{8}{10} =$  | $\frac{5}{10} =$  | $\frac{10}{14} =$ | $\frac{8}{16} =$  | $\frac{14}{20} =$ | $\frac{12}{16} =$ |
| 6. $\frac{16}{20} =$ | $\frac{14}{21} =$ | $\frac{15}{21} =$ | $\frac{21}{24} =$ | $\frac{12}{18} =$ | $\frac{20}{24} =$ |

\* 36ths

$$\frac{\frac{3}{4}}{\frac{1}{11}} = \frac{9}{4} = 2\frac{1}{4}$$

† 36ths

$$\frac{4\frac{1}{4}}{2\frac{1}{11}} = \frac{9}{4} = 2\frac{1}{4}$$

*Reduce to equivalent fractions having a common denominator :*

7.  $\frac{3}{5}$  and  $\frac{4}{7}$ . (The l. c. m. of 5 and 7 is ———.)  $\frac{3}{5} = \frac{4}{7} =$

8.  $\frac{2}{3}$  and  $\frac{5}{7}$ . (The l. c. m. of 3 and 7 is ———.)  $\frac{2}{3} = \frac{5}{7} =$

9.  $2\frac{1}{3}$  is a mixed number.  $7\frac{3}{4}$  is a ——— number.

10. A number thus expressed by a whole number and a fraction is a ——— number.

11.  $2\frac{1}{3} = \frac{\quad}{3}$ .  $7\frac{3}{4} = \frac{\quad}{4}$ .  $\frac{7}{3}$  and  $\frac{31}{4}$  are improper fractions.

12.  $\frac{3}{7}$  and  $\frac{4}{31}$  are proper fractions.

13.  $\frac{8}{8}$  and  $\frac{9}{8}$  are improper fractions. A proper fraction is less than one whole. An improper fraction is equal to one whole, or greater.

14. Among these numbers,  $\frac{4}{5}$ ,  $\frac{8}{7}$ ,  $\frac{4}{4}$ ,  $\frac{3}{5}$ ,  $\frac{9}{3}$ , and  $\frac{5}{6}$ , the proper fractions are ———, ———, and ———; and the improper fractions are ———, ———, and ———.

*Reduce to whole or mixed numbers :*

15.  $\frac{19}{2} =$        $\frac{23}{4} =$        $\frac{17}{3} =$        $\frac{27}{5} =$        $\frac{16}{5} =$        $\frac{19}{4} =$

WRITTEN

*Reduce to lowest terms :*

16.  $\frac{18}{57}$ .      17.  $\frac{21}{28}$ .      18.  $\frac{25}{75}$ .      19.  $\frac{18}{54}$ .

*Reduce to improper fractions :*

20.  $28\frac{3}{5}$ .      21.  $35\frac{4}{7}$ .      22.  $57\frac{3}{7}$ .      23.  $69\frac{5}{9}$ .

*Reduce to whole or mixed numbers :*

24.  $\frac{138}{8}$ .      25.  $\frac{347}{8}$ .      26.  $\frac{401}{4}$ .      27.  $\frac{602}{7}$ .

## XXVII. MISCELLANEOUS

## ORAL

1. Reduce to whole or mixed numbers :

$$\frac{15}{3} = \frac{14}{3} = \frac{13}{4} = \frac{29}{5} = \frac{36}{6} = \frac{40}{10} =$$

2. Reduce to improper fractions :

$$3\frac{1}{7} = 2\frac{3}{5} = 9\frac{1}{3} = 2\frac{5}{8} = 7\frac{1}{3} = 11\frac{1}{4} =$$

3. Reduce to equivalent fractions having a common denominator :

$$\frac{2}{3}, \frac{1}{2}, \frac{1}{5}. \text{ (The l.c.m. of 3, 2, and 5 is ———.)}$$

$$\frac{2}{3} = \frac{1}{2} = \frac{7}{5} =$$

$$\frac{1}{2}, \frac{2}{3}, \frac{1}{10}. \text{ (The l.c.m. of 2, 3, and 10 is ———.)}$$

$$\frac{1}{2} = \frac{2}{3} = \frac{1}{10} =$$

4. Add
- $\frac{1}{6}$
- and
- $\frac{3}{7}$
- . (Change to ———ds.)

5. Find the difference of
- $\frac{3}{7}$
- and
- $\frac{1}{6}$
- .

6. Multiply
- $\frac{3}{8}$
- by 6.

7. Divide
- $\frac{3}{8}$
- by
- $\frac{1}{2}$
- . This means, find how many times
- $\frac{1}{2}$
- is contained in
- $\frac{3}{8}$
- . Change
- $\frac{3}{8}$
- and
- $\frac{1}{2}$
- to ———ths.
- $\frac{3}{8} = \frac{3}{10}$
- .
- $\frac{1}{2} = \frac{1}{10}$
- . ——— tenths are contained ——— tenths ——— times.

*Concrete example.* If  $\$ \frac{1}{2}$  will pay for a bushel of apples,  $\$ \frac{3}{8}$  will pay for ——— and ——— ——— bushels.

8. Multiply 10 by
- $2\frac{3}{5}$
- . This means, find 2 times 10 and
- $\frac{3}{5}$
- of 10.
- $2\frac{3}{5}$
- times 10 =

## WRITTEN

*Reduce to whole or mixed numbers :*

$$9. \frac{234}{3}, \quad 10. \frac{347}{5}, \quad 11. \frac{543}{7}, \quad 12. \frac{564}{9}, \quad 13. \frac{721}{14}.$$

14.  $\frac{275}{4}$ .    15.  $\frac{432}{6}$ .    16.  $\frac{379}{8}$ .    17.  $\frac{843}{13}$ .

*Reduce to improper fractions :*

18.  $28\frac{3}{5}$ .    19.  $63\frac{2}{3}$ .    20.  $19\frac{3}{4}$ .    21.  $29\frac{5}{6}$ .  
 22. Add  $5\frac{1}{6}$  and  $314\frac{4}{7}$ .\*    25. From  $89\frac{4}{7}$  subtract  $23\frac{1}{6}$ .  
 23. Add  $28\frac{5}{6}$  and  $67\frac{6}{7}$ .    26. From  $104\frac{5}{7}$  subtract  $29\frac{1}{6}$ .  
 24. Add  $143\frac{1}{6}$  and  $29\frac{5}{7}$ .    27. Multiply  $16\frac{4}{5}$  by 6.  
 28. Multiply  $46\frac{2}{5}$  by  $\frac{1}{3}$ .† (This means —.)  
 29. Multiply  $28\frac{3}{4}$  by  $\frac{2}{3}$ .†  
 30. Divide  $4\frac{2}{3}$  by  $\frac{1}{2}$ . (Change to —ths.)

# XXVIII. REVIEW

## ORAL

1. Add  $\frac{1}{8}$  and  $\frac{1}{10}$ .    9. Multiply  $7\frac{1}{2}$  by  $2\frac{1}{2}$ .  
 2. From  $4\frac{1}{8}$  subtract  $3\frac{1}{10}$ .    10. Divide  $\frac{3}{7}$  by  $\frac{1}{3}$ .†  
 3. Multiply  $\frac{7}{8}$  by 4.    11. Divide 10 by  $\frac{2}{3}$ .†  
 4. Multiply  $25\frac{6}{7}$  by  $2\frac{3}{5}$ .†    12. Divide  $5\frac{2}{3}$  by  $1\frac{1}{3}$ .†  
 5. Multiply  $28\frac{6}{7}$  by  $\frac{3}{4}$ .    13. Divide  $1\frac{1}{4}$  by 4.  
 6. Multiply  $\frac{4}{5}$  by 7.    14. Divide  $15\frac{1}{4}$  by 4.  
 7. Multiply  $\frac{3}{7}$  by  $\frac{1}{2}$ .    15. Divide  $\$7\frac{1}{2}$  by 3.  
 8. Multiply  $2\frac{3}{4}$  by  $\frac{1}{3}$ .    16. Divide  $\$17\frac{1}{2}$  by 3.

$$\begin{array}{r} * 5\frac{1}{2} = 5\frac{7}{12} \text{ or } 5\frac{1}{2} \quad \begin{array}{r} 42\text{ds} \\ 7 \\ 24 \\ 312 \end{array} \\ 314\frac{4}{7} = 314\frac{44}{49} \quad \begin{array}{r} 314\frac{4}{7} \\ 319\frac{44}{49} \end{array} \end{array}$$

$$\begin{array}{r} 5\frac{1}{2} = \frac{7}{2} \\ 314\frac{4}{7} = \frac{44}{7} \\ 319\frac{44}{49} \end{array}$$

Best form.

Avoid this form. It is not true.

† Divide  $46\frac{2}{3}$  by 3 without changing  $46\frac{2}{3}$  to an improper fraction. Do not change  $28\frac{1}{4}$  to an improper fraction.

† Require the pupil to give the meaning if there is any hesitation.



## WRITTEN

- |  |   |   |
|--|---|---|
| 17. $39\frac{1}{8} + 16\frac{1}{10}$ . | 23. $\frac{3}{7} \times 14\frac{1}{2}$ .  | 28. $23\frac{2}{3} \div 1\frac{1}{3}$ . |
| 18. $28\frac{1}{8} - 9\frac{1}{10}$ .  | 24. $19\frac{3}{4} \times \frac{1}{3}$ .  | 29. $382\frac{1}{4} \div 4$ .           |
| 19. $62\frac{7}{8} \times 8$ .         | 25. $27\frac{1}{2} \times 2\frac{1}{2}$ . | 30. $171\frac{1}{4} \div 4$ .           |
| 20. $84 \times 4\frac{3}{4}$ .         | 26. $48\frac{3}{7} \div \frac{1}{3}$ .    | 31. $\$117\frac{1}{2} \div 3$ .         |
| 21. $96 \times 5\frac{3}{4}$ .         | 27. $360 \div \frac{3}{5}$ .              | 32. $\$127\frac{1}{2} \div 3$ .         |
| 22. $72\frac{4}{5} \times 7$ .         |   |   |

NOTE. — Teachers should make sure that every pupil can suggest a practical application of each of these examples. To this end the first sixteen examples should be carefully considered. For instance, the first two examples might be applied thus:  $\frac{1}{8}$  of a bushel and  $\frac{1}{10}$  of a bushel are  $\frac{2}{40}$  of a bushel.  $3\frac{1}{10}$  inches broken from the end of a stick  $4\frac{1}{8}$  inches long leaves the stick only  $1\frac{1}{40}$  inches long. The 11th example might be applied thus: at  $\$ \frac{2}{3}$  a pound, \$10 would pay for 25 pounds of coffee.

## XXIX. DECIMALS. THOUSANDTHS

## ORAL

1. We have seen that  $\frac{4}{10} = .4$  and that  $\frac{4}{100} = .04$ .

It will be easy to learn that  $\frac{4}{1000} = .004$ . (There are as many decimal places in the decimal as there are ciphers in the denominator.)

2. 2.4 is read either 2 and 4 tenths, or 24 tenths.

3. 2.45 is read either 2 and 45 hundredths or two hundred forty-five hundredths.

4. 3.547 is read either 3 and 547 thousandths, or 3,547 thousandths.

5. Read these decimals both ways: 2.8, 2.56, 8.457, 9.8, 7.84, 6.859, 9.804, 62.523, 8.429, 7.003.

6. The number 6.859 is a number whose parts are 6 wholes, 8 tenths, 5 hundredths, and 9 thousandths.

7. The number 8.429 has for its parts 8 —, 4 —, 2 —, and 9 —.

8. The parts of 8.763 are 8 —, 7 —, 6 —, and 3 —.

9. The parts of 3.763 are 3 —, 5 —, 7 —, and 8 —.

10. .123 and .004 are — thousandths.

11. .123 and .04 are — thousandths.

12. .123 and .4 are — thousandths.

13. .425 less .002 are — thousandths.

14. .425 less .02 are — thousandths.

15. .425 less .2 are — thousandths.

16. 3 times 7.005 are — and — thousandths.

17.  $.042 \div .006 =$  (This means —.)

18.  $.729 \div 9 =$  (This means —.)

## WRITTEN

19.  $5.007 + 6.08 + 4.3.*$       22.  $72.127 - 19.318.$

20.  $2.016 + 1.24 + 9.037.$       23.  $6.28 - 1.572.$

21.  $6.208 - 2.079.$       24.  $7.64 \text{ miles} \div 4.†$

25.  $\$2.105 \div \$.005.†$

26. Add \$6.4, \$7.08, and \$1.125.

27. From 7.2 mi. subtract 5.04 mi.

\* Write in columns before adding.

† In case of doubt require the meaning.

28. Multiply 7.125 bu. by 5.\*
29. Divide \$8.4 by \$.04.†
30. Divide \$7.08 by \$.005.†
31. Divide \$.675 by 25.
32. Divide \$.675 by \$.025.

### XXX. MULTIPLICATION AND DIVISION OF DECIMALS

*Learn :*

- 10 mills are 1 cent.
- 10 cents are 1 dime.
- 10 dimes are 1 dollar.
- 10 dollars are 1 eagle.

#### ORAL

1. One dollar equals — dimes, or — cents, or — mills.
2. One dime is — — of a dollar.
3. One cent is — — of a dollar.
4. One mill is — — of a dollar.
5. One tenth of a dollar is — dime.
6. Three tenths of a dollar are — dimes.

\*5 times 5 thousandths are 25 thousandths. 25 thousandths = 2 hundredths and 5 thousandths. Write the 5 thousandths. 5 times 2 hundredths are 10 hundredths, and 2 hundredths are 12 hundredths. 12 hundredths = 1 tenth and 2 hundredths. Write the 2 hundredths.

5  
35.625 bu. 5 times 1 tenth are 5 tenths, and 1 tenth are 6 tenths. Write the 6 tenths. Place the point. 5 times 7 are 35. 5 times 7.125 bu. equal what? How many decimal places in the multiplicand? How many in the multiplier? How many in both? How many in the product?

†In case of doubt, require the meaning.

7. Three hundredths of a dollar are — cents.
8. One thousandth of a dollar is — mill.
9. Six thousandths of a dollar are — mills.
10.  $\$8.45 = 8$  —,  $4$  —, and  $5$  —.
11.  $\$9.345 = 9$  —,  $3$  —,  $4$  —, and  $5$  —.
12.  $\$8.56 =$  — cents.  $\$5.625 =$  — mills.
13.  $\$6.3 =$  — dimes.  $\$4.75 =$  — mills.
14.  $.1$  of  $\$90 =$   $.1$  of  $\$84 =$   $.1$  of  $\$97 =$
15.  $.1$  of  $\$.1 =$   $.1$  of  $\$.2 =$   $.1$  of  $\$.6 =$
16.  $.1$  of  $\$2 =$   $.1$  of  $\$2.6 =$   $.1$  of  $\$3.64 =$
17.  $.2$  of  $\$90 =$   $.2$  of  $\$84 =$   $.2$  of  $\$97 =$
18.  $.2$  of  $\$.1 =$   $.2$  of  $\$.2 =$   $.2$  of  $\$.6 =$
19. Multiply  $\$245$  by  $.5$ . This means find 5 tenths of  $\$245$ .  

One tenth of  $\$245 =$  —.\* Five tenths of  $\$245 =$  —.

$\$245 = 5$  times  $\$24.5$ , or  $\$122.5$ . Practical application. At  $\$245$  an acre,  $.5$  of an acre will cost  $\$122.5$ .
20. If  $\frac{1}{2}$  lb. of meat costs  $10\text{¢}$ ,  $3\frac{1}{2}$  lb. will cost —.

## WRITTEN

21. Multiply 642 by  $.4$ .
22. Multiply 69.3 by  $.5$ .†
23. Multiply 8.43 by  $.6$ .
24. Multiply  $\$4.32$  by  $4.5$ .
25. Divide  $\$64.5$  by  $\$.5$ .
26. Divide  $\$8.5$  by  $\$.05$ .

\* In getting  $.1$  of  $\$245$ , no point should be used, the pupil doing the work mentally.

† How many decimal places in the multiplicand and multiplier together? How many in the product?

## XXXI

## ORAL

1. One tenth of \$80 = .2 of \$80 =
2. One hundredth of \$800 = .02 of \$800 =
3. One hundredth of \$830 = .02 of \$830 =
4. One hundredth of \$834 = .02 of \$834 =
5. .01 of \$500 = .01 of \$50 = .01 of \$550 =
6. .01 of \$.1 = .01 of \$.2 = .01 of \$.3 =
7. .01 of \$5.4 = .01 of \$6.7 = .01 of \$9.4 =
8. .01 of \$6.43 = .01 of \$84.2 = .01 of \$935 =
9. .1 of \$123 = .2 of \$123 = .3 of \$123 =

## WRITTEN

10. Multiply \$235 by .04. This means find 4 hundredths of \$235.

\$235      One hundredth of \$235 = \$2.35.

.04      4 hundredths of \$235 = 4 times \$2.35, or  
\$9.40      \$9.40.

11. Multiply \$439 by .05.      14. 320 rd.  $\times$  .08.

12. Multiply \$540 by .06.      15. 452 rd.  $\times$  .09.

13. Multiply \$784 by .07.      16. \$725  $\times$  .34.

Multiply \$725 by .34. This means find .34 of \$725.

\$725      One hundredth of \$725 = \$7.25

.34      4 hundredths of \$725 = 4 times \$7.25 = \$29.00

2900      1 tenth of \$725 = \$72.5

2175      3 tenths of \$725 = 3 times \$72.5 = \$217.5

\$246.50      \$29 and \$217.5 are \$246.50

NOTE. — The pupil should bear in mind: 4 hundredths of \$725 are 4 times 1 hundredth of \$725; 3 tenths of \$725 are 3 times 1 tenth of \$725.

How many decimal places in the multiplicand and multiplier together? How many in the product?

17. Multiply \$834 by .25.

18. Multiply \$284 by .65.

19. Multiply 342 rods by .78.

20. Multiply 678 rods by .94.

*Divide:*

21.  $$.05 \overline{) \$39.2}$

22.  $7 \overline{) 64.47}$  rods

### XXXII. WEIGHTS AND MEASURES

#### ORAL

1. — inches = 1 foot (ft.).
2. — feet = 1 yard (yd.).
3. — yards = 1 rod (rd.).
4. — feet = 1 rod.
5. — rods = 1 mile (mi.).
6. — ounces = 1 pound (lb.).
7. — pounds = 1 hundredweight (cwt.).
8. — pounds = 1 ton (T.).
9. .1 of a mile = — rods.
10. 1.1 miles = — rods.
11. .2 of a mile = — rods.

12. 1.2 miles = ——— rods.
13. .5 of a mile = ——— rods.
14. 40 rods are ——— ——— of a mile.
15. 160 rods are ——— ——— of a mile.
16. 80 rods are ——— ——— of a mile.
17. 640 rods = ——— miles.
19. 2 rods = ——— feet.
18. 960 rods = ——— miles.
20. 4 rods = ——— feet.
21. A surveyor's chain = 4 rods.
22. A surveyor's chain = ——— ft.
23. 1000 lb. = ——— ——— of a ton.
24. 500 lb. = ——— ——— of a ton.
25. 200 lb. = ——— ——— of a ton.
26. 1500 lb. = ——— ——— of a ton.
27. 1600 lb. = ——— ——— of a ton.

## WRITTEN

28. .23 mi. = ——— rd.\*
29. .25 mi = ——— rd.
30. 14 rd. = ——— ft.†
31. 4800 rd. = ——— mi.
32.  $115\frac{1}{2}$  ft. = ——— rd.
33. 7 cwt. = ——— lb.
34. .3 cwt. = ——— lb.
35. 6.8 tons = ——— lb.
36. At \$16 a ton, 5500 lb. of hay will cost ———.

\* 320 rd. .23 mi. = .23 of  
 $\frac{.23}{.960}$  320 rd., or 73.6 rd.

$\frac{640}{73.60}$  rd.

†  $16\frac{1}{2}$  ft. 14 rd. = 14 times  
 $\frac{14}{7}$   $16\frac{1}{2}$  ft., or 231 ft.

$\frac{64}{16}$   
 231 ft.

## XXXIII. WEIGHTS AND MEASURES. TON

## ORAL

1. 2 tons are — pounds. 3 tons are — pounds.
2. .1 of a ton is — pounds. .4 of a ton are — pounds.
3. .01 of a ton is — pounds. .03 of a ton are — pounds.
4. .04 of a ton are — pounds. .05 of a ton are — pounds.
5. .001 of a ton is — pounds. .002 of a ton are — pounds.
6. 2500 pounds = — and — — tons.
7. 2400 pounds = — and — tenths tons.
8. 2600 pounds = — and — tenths tons.
9. 2800 pounds = — and — tenths tons.
10. In 8000 pounds there are — tons.
11. To change pounds to tons, point off three figures from the right and divide by —.
12. In 12000 lb. there are — tons.
13. In 4360 lb. there are — tons.
14. In 2 miles there are — rods.
15. 5 yd. = — ft.
18. 4 rd. = — ft.
16. 7 yd. = — ft.
19. 4 lb. = — oz.
17. 6 rd. = — ft.
20. 5 lb. = — oz.



## WRITTEN

*Find the cost of:**Change:*

- |  |                      |
|--|----------------------|
| 21. 4600 lb. of coal at \$5.80 a ton.* | 25. 846 yd. to ft.   |
| 22. 7460 lb. of hay at \$14.25 a ton.  | 26. 84 rd. to ft.    |
| 23. 3400 lb. of hay at \$12.50 a ton.  | 27. 8464 oz. to lb.  |
| 24. 2900 lb. of coal at \$4.65 a ton.  | 28. 96084 in. to ft. |

## XXXIV. WEIGHTS AND MEASURES. AREA. VOLUME

## ORAL

- John lives 80 rods, or ——— of a mile, from the school house.
- James walks  $\frac{1}{2}$  of a mile, or ——— rods, to school.
- A farmer dug a ditch 2 rods, or ——— feet, long.
- 4 lb. 8 oz. at 20¢ a lb. will cost ———.
- $10\frac{1}{2}$  yd. of ribbon at 6¢ a yd. will cost ———.
- A 3-foot square contains ——— square feet.
- A 3-foot square is a ——— yard.

$$\begin{array}{r}
 2000 \text{ lb. } \overline{) 4600.0 \text{ lb.}} \\
 \underline{4000} \phantom{0} \\
 600.0 \\
 \underline{600.0} \\
 0
 \end{array}$$

\* 2.3  $\therefore$  2.3 tons.

To divide by 2000, we may point off three places from the right (4.600), and divide by 2 (2.300).

$$\begin{array}{r}
 \sqrt{2)4600} \\
 2.3 \therefore 2.3 \text{ tons.}
 \end{array}$$

$$\begin{array}{r}
 \$5.80 \\
 2.3 \\
 \underline{1740} \\
 1160 \\
 \underline{\$13.340}
 \end{array}$$

How many decimal places in the multiplicand and the multiplier together?

How many decimal places, then, in the product?

This sign ( $\therefore$ ) stands for "therefore."

8. — square feet are a square yard.
9. A 2-inch square has an area of — square inches.
10. A 2-inch cube has a volume of — cubic inches.\*
11. A 3-inch square has an area of — square inches.
12. A 3-inch cube has a volume of — cubic inches.
13. A 3-foot cube has a volume of — cubic feet.
14. A 3-foot cube is a — yard.
15. — cubic feet are a cubic yard.

## WRITTEN

16. 8 rods = — ft.
17. 12 rods = — ft.
18. How many square feet in a rectangle 5 yd. by 6 yd.?
19. How many square feet in a lot 20 yd. by 16 yd.?
20. How many square yards in 8467 square feet?
21. Find the area of a 12-ft. square.

*Find the area of a :**Find the volume of a :*

22. 13-foot square.

26. 6-foot cube.

23. 14-foot square.

27. 7-foot cube.

24. 15-foot square.

28. 9-yard cube.

25. 16-foot square.

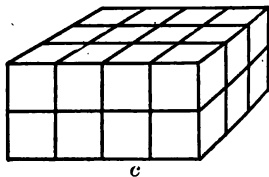
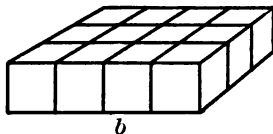
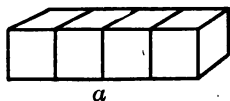
29. 12-inch cube.

\* Pupils should build the 2-inch and 3-inch cubes with 1-inch cubes.

## XXXV. VOLUME

## ORAL

1. A 12-inch square has an area of — sq. in.
2. — square inches are one square foot.
3. 2 square feet are — sq. in.
4. 5 qt. are — pints. 7 bu. are — pecks.
5. 5 gal. are — quarts. 7 yd. are — feet.
6. 3 wk. are — days. 2 yd. are — inches.
7. 3 hr. are — minutes. 2 lb. are — ounces.
8. 6 yr. are — months. 8 min. are — seconds.
9. 6 pk. are — quarts. 8 bu. are — pecks.
10. At \$6 a ton, 3000 lb. of coal will cost —.
11. At \$10 a ton, 5000 lb. of hay will cost —.



12. The volume of a rectangular solid 1 in. by 1 in. by 4 in. is — cu. in. (See Fig. *a*.)
13. The volume of a rectangular solid 3 in. by 4 in. by 1 in. is — cubic inches.\* (Fig. *b*.)
14. The volume of a rectangular solid 3 in. by 4 in. by 2 in. is — cubic inches.\* (Fig. *c*.)

\* Pupils should build the solid with 1-inch cubes.

15. The area of a rectangle 4 in. by 5 in. is — sq. in.

16. The volume of a rectangular solid 4 in. by 5 in. by 2 in. is — cu. in.

### WRITTEN

17. The volume of a rectangular solid 8 in. by 9 in. by 6 in. is — cu. in.\*

*How many cubic yards in a rectangular solid which is :*

18. 5 ft. by 6 ft. by 8 ft. ?      21. 7 ft. by 8 ft. by 16 ft. ?

19. 8 ft. by 6 ft. by 12 ft. ?      22. 3 ft. by 7 ft. by 9 ft. ?

20. 12 ft. by 8 ft. by 7 ft. ?      23. 3 ft. by 9 ft. by 4 ft. ?

## XXXVI. RATIO, PROPORTION, AND PERCENTAGE (a)

### ORAL

1. One third of 21 is —. 21 is  $\frac{1}{3}$  of —.

2. One half of 13 is —. 13 is  $\frac{1}{2}$  of —.

3. One fifth of 35 is —. 35 is  $\frac{1}{5}$  of —.

4. 2 thirds of 30 are —. 30 is  $\frac{2}{3}$  of —.

5. 2 thirds of 42 are —. 42 is  $\frac{2}{3}$  of —.

6. 4 is — — of 6. 6 is — — of 4, or — times 4.

7. 12 is — — of 18. 18 is — — of 12, or — times 12.

8. 50% of 16 = † 16 is 50% of —.

\* The bottom layer, 8 in. by 9 in., contains 8 times 9, or 72 cu. in. There are 6 such layers; therefore 6 times 72 cu. in., or 432 cu. in.

† 20% = .20 =  $\frac{1}{5}$ .    25% = .25 =  $\frac{1}{4}$ .    33 $\frac{1}{3}$ % = .33 $\frac{1}{3}$  =  $\frac{1}{3}$ .    50% = .50 =  $\frac{1}{2}$ .  
See App. No. 2.

9.  $33\frac{1}{3}\%$  of 9 = 9 is  $33\frac{1}{3}\%$  of —.
10. 20% of 25 = 25 is 20% of —.
11. 25% of 20 = 20 is 25% of —.
12. 8 is —% of 16. 8 is —% of 32.
13. 9 is —% of 27. 4 is —% of 12.
14. 4 is —% of 20. 6 is —% of 30.
15. 7 is —% of 28. 8 is —% of 24.
16. 10 is — — of 15. A man who earns \$30 in 15 days in 10 days can earn — — of \$30, or —.
17. Jacob had \$30; he spent 20% of his money. He spent — dollars.

## WRITTEN

18. 15 acres produced 3000 bu. of potatoes. How many bushels should 10 acres produce?
19. If 6 acres cost \$1290, what should 4 acres cost?
20. 18 is — and — — times 12. In 12 hours a train ran 480 miles. How far should it go in 18 hours?
21. Find 20% of 6125.
22. Find  $33\frac{1}{3}\%$  of 8436 pk.
23. Find 25% of \$87.64.
24. \$98.50 are 20% of —.
25. \$3.85 are  $33\frac{1}{3}\%$  of —.
26. 185 bu. are 25% of —.

## XXXVII. RATIO, ETC. (b)

## ORAL

1.  $\frac{2}{3}$  of 12 are 1 half of —.
2.  $\frac{2}{3}$  of 15 are 1 half of —.
3.  $\frac{3}{4}$  of 16 are 2 thirds of —.
4. 50% of 16 is —. 50% of 21 is —.
5. 25% of 24 is —. 25% of 25 is —.
6.  $33\frac{1}{3}\%$  of 15 is —.  $33\frac{1}{3}\%$  of 17 is —.
7. 20% of 35 is —. 20% of 42 is —.
8. 3 is 50% of —.  $3\frac{1}{2}$  is 50% of —.
9. 4 is 20% of —.  $4\frac{1}{3}$  is  $20\frac{1}{3}\%$  of —.
10. 12 is  $33\frac{1}{3}\%$  of —.  $12\frac{1}{3}$  is  $33\frac{1}{3}\%$  of —.
11. 7 is —% of 14. 7 is —% of 28.
12. 7 is —% of 21. 7 is —% of 35.
13. 9 is —% of 18. 9 is —% of 27.
14. 9 is —% of 36. 9 is —% of 25.
15. 1% (one hundredth) of 200 is —. 2% of 200 is —.
16. 1% of 300 is —. 4% of 300 is —.
17. 1% of 400 is —. 6% of 400 is —.

## WRITTEN

18.  $\frac{2}{3}$  of 93 is  $\frac{1}{2}$  of what number?
19.  $\frac{2}{3}$  of 108 are  $\frac{1}{2}$  of what number?

20.  $\frac{3}{4}$  of 96 are  $\frac{2}{3}$  of what number?  
 21.  $\frac{3}{4}$  of 104 are  $\frac{2}{3}$  of what number?  
 22. Find 50% of 896.\*      26.  $48\frac{1}{3}$  is  $33\frac{1}{3}\%$  of \_\_\_\_.  
 23. Find  $33\frac{1}{3}\%$  of 978.      27.  $28\frac{1}{3}$  is 25% of \_\_\_\_.  
 24. Find 25% of 987.      28.  $84\frac{1}{2}$  is 20% of \_\_\_\_.  
 25.  $92\frac{1}{2}$  is 50% of \_\_\_\_.

## XXXVIII. RATIO, ETC. (c)

## ORAL

1. One sixth of 12 is \_\_\_\_\_. 12 is  $\frac{1}{6}$  of \_\_\_\_\_.
2. One seventh of 14 is \_\_\_\_\_. 14 is  $\frac{1}{7}$  of \_\_\_\_\_.
3. One eighth of 16 is \_\_\_\_\_. 16 is  $\frac{1}{8}$  of \_\_\_\_\_.
4. Three fourths of 12 are \_\_\_\_\_. 12 is  $\frac{3}{4}$  of \_\_\_\_\_.
5. Three fourths of 24 are \_\_\_\_\_. 24 is  $\frac{3}{4}$  of \_\_\_\_\_.
6.  $16\frac{2}{3}\%$  of 12 is \_\_\_\_\_. † 12 is  $16\frac{2}{3}\%$  of \_\_\_\_\_.
7.  $14\frac{2}{7}\%$  of 14 is \_\_\_\_\_. † 14 is  $14\frac{2}{7}\%$  of \_\_\_\_\_.
8.  $12\frac{1}{2}\%$  of 24 is \_\_\_\_\_. † 24 is  $12\frac{1}{2}\%$  of \_\_\_\_\_.
9.  $12\frac{1}{2}\%$  of 32 is \_\_\_\_\_. 32 is  $12\frac{1}{2}\%$  of \_\_\_\_\_.
10. 6 is \_\_\_\_\_ of 9. 9 is \_\_\_\_\_ of 6.
11. 6 is \_\_\_\_\_ of 36. 36 is \_\_\_\_\_ times 6.
12. 15 is \_\_\_\_\_ of 20. 20 is \_\_\_\_\_ of 15.

\* Find 50% of 896 by finding  $\frac{1}{2}$  of it.

†  $92\frac{1}{2}$  is 50% of 2 times  $92\frac{1}{2}$ .

†  $16\frac{2}{3}\% = .16\frac{2}{3} = \frac{1}{6}$ .  $14\frac{2}{7}\% = .14\frac{2}{7} = \frac{1}{7}$ .  $12\frac{1}{2}\% = .12\frac{1}{2} = \frac{1}{8}$ . See App. No. 2.

13. 25 is ——— of 30.\* 30 is ——— of 25.
14. 2 is ———% of 12. 2 is ———% of 6.
15. 3 is ———% of 24. 3 is ———% of 21.
16.  $\frac{2}{3}$  of 21 are 1 half of ———.
17.  $\frac{2}{3}$  of 27 are 1 half of ———.
18.  $\frac{3}{4}$  of 28 are 2 thirds of ———.
19. 12 is ——— of 16. A man can travel ———  
 ——— as far in 12 days as he can in 16 days. If he can  
 travel 240 miles in 16 days, in 12 days he can travel ———  
 miles.

## WRITTEN

20. If a man can earn \$1304 in 16 months, how much  
 can he earn in 12 months?
21. If a family's expenses for 18 days are \$126, what  
 are they for 12 days?

*Find  $121\frac{1}{2}\%$  of:*      *Find  $16\frac{2}{3}\%$  of:*      *Find  $14\frac{2}{7}\%$  of:*

- |              |               |             |
|--------------|---------------|-------------|
| 22. \$1840.  | 24. 1992 qt.  | 26. 924 pk. |
| 23. \$92.40. | 25. 8430 gal. | 27. 833 pk. |

## XXXIX. RATIO, ETC. (d)

## ORAL

1. 50 % of 13 = 13 is 50 % of ———.
2.  $33\frac{1}{3}\%$  of 23 = 23 is  $33\frac{1}{3}\%$  of ———.
3. 25 % of 26 = 26 is 25 % of ———.
4. 20 % of 38 = 38 is 20 % of ———.

\* 25 is ( $\frac{5}{6}$ ) five sixths of 30.



5.  $16\frac{2}{3}\%$  of 13 = 13 is  $16\frac{2}{3}\%$  of —.
6.  $12\frac{1}{2}\%$  of 17 = 17 is  $12\frac{1}{2}\%$  of —.
7.  $14\frac{2}{7}\%$  of 15 = 15 is  $14\frac{2}{7}\%$  of —.
8. 8 is — % of 16. 8 is — % of 24.
9. 8 is — % of 32. 8 is — % of 40.
10. 8 is — % of 48. 8 is — % of 56.
11. 8 is — % of 64. 9 is — % of 36.
12. 1 % of 500 = 2 % of 500 =
13. 1 % of 430 = 2 % of 430 =
14. 1 % of 523 = 2 % of 523 =
15. 1 % of \$632 = 3 % of \$632 =

## WRITTEN

16. Find 50 % of \$296.
17. Find  $33\frac{1}{3}\%$  of \$342.
18. Find 25 % of \$14.24.
19. Find 20 % of \$92.60.
20. Find  $16\frac{2}{3}\%$  of \$19.56.
21. Find  $14\frac{2}{7}\%$  of \$29.61.
22. Find  $12\frac{1}{2}\%$  of \$84.16.
23.  $35\frac{1}{2}$  is  $12\frac{1}{2}\%$  of what?
24.  $703\frac{1}{2}$  is 50 % of what?
25.  $84\frac{1}{2}$  is  $33\frac{1}{3}\%$  of what?
26.  $402\frac{1}{3}$  is  $14\frac{2}{7}\%$  of what?
27.  $103\frac{3}{4}$  is  $16\frac{2}{3}\%$  of what?
28. A farmer had 200 bu. of potatoes. 20 % of them decayed. He lost — bushels.
29. 3 % of \$968 =
30. 4 % of \$840 =
31. 5 % of \$840 =
32. 6 % of \$840 =
33. 7 % of \$840 =
34. 8 % of \$842 =
35. 9 % of \$842 =

36.  $\frac{1}{2}$  of 162 is  $\frac{1}{3}$  of what number?
37.  $\frac{2}{3}$  of 96 is  $\frac{1}{2}$  of what number?
38.  $\frac{3}{4}$  of 128 is  $\frac{2}{3}$  of what number?
39.  $\frac{2}{3}$  of 45 is  $\frac{3}{4}$  of what number?

## XL. RATIO, ETC. (e)

### ORAL

1.  $\frac{1}{2}$  of 11 is ——. 11 is  $\frac{1}{2}$  of —.
2.  $\frac{1}{3}$  of 19 is ——. 19 is  $\frac{1}{3}$  of —.
3.  $\frac{1}{4}$  of 23 is ——. 23 is  $\frac{1}{4}$  of —.
4.  $\frac{1}{5}$  of 21 is ——. 21 is  $\frac{1}{5}$  of —.
5.  $\frac{1}{6}$  of 31 is ——. 31 is  $\frac{1}{6}$  of —.
6.  $\frac{2}{5}$  of 20 are ——. 20 is  $\frac{2}{5}$  of —.
7.  $\frac{3}{5}$  of 30 are ——. 30 is  $\frac{3}{5}$  of —.
8.  $11\frac{1}{9}\%$  of 18 = \* 18 is  $11\frac{1}{9}\%$  of —.
9. 10% of 30 = 30 is 10% of —.
10.  $11\frac{1}{9}\%$  of 27 = 27 is  $11\frac{1}{9}\%$  of —.
11.  $12\frac{1}{2}\%$  of 41 = 41 is  $12\frac{1}{2}\%$  of —.
12.  $14\frac{2}{7}\%$  of 22 = 22 is  $14\frac{2}{7}\%$  of —.
13.  $16\frac{2}{3}\%$  of 25 = 25 is  $16\frac{2}{3}\%$  of —.
14.  $33\frac{1}{3}\%$  of 4 = 4 is  $33\frac{1}{3}\%$  of —.
15. 50% of 5 = 5 is 50% of —.

\*  $11\frac{1}{9}\% = .11\frac{1}{9} = \frac{1}{9}$ . 10% = .10 =  $\frac{1}{10}$ .  $11\frac{1}{9}\%$  of 27 =  $\frac{1}{9}$  of 27. See App. No. 2.

16. 16 is ——— of 24. 24 is ——— of 16.  
 17. 15 is ——— of 20. 20 is ——— of 15.  
 18. 2 is ———% of 18. 3 is ———% of 27.  
 19. 2 is ———% of 20. 3 is ———% of 30.

## WRITTEN

20. Find  $\frac{1}{9}$  of 918.  
 21. 918 is  $\frac{1}{9}$  of what number?  
 22. Find  $\frac{1}{8}$  of 736. 27. 120 is  $\frac{3}{5}$  of what?  
 23. 736 is  $\frac{1}{8}$  of what? 28. Find  $11\frac{1}{9}\%$  of 279.  
 24. Find  $\frac{2}{5}$  of 620. 29. 92 is  $11\frac{1}{9}\%$  of what?  
 25. 620 is  $\frac{2}{5}$  of what? 30. Find 10% of 850.  
 26. Find  $\frac{3}{5}$  of 120. 31. 850 is 10% of what?  
 32. 16 is ——— of 24. If 24 tons cost \$288, what  
 will 16 tons cost?  
 33.  $\frac{2}{5}$  of 120 are  $\frac{1}{2}$  of what?

## XLI. RATIO, ETC. (f)

## ORAL

1.  $11\frac{1}{9}\%$  of 54 =  $11\frac{1}{9}\%$  of 72 =  
 2. 10% of 60 = 10% of 62 =  
 3. 5 is  $11\frac{1}{9}\%$  of ———.  $5\frac{1}{3}$  is  $11\frac{1}{9}\%$  of ———.  
 4. 8 is 10% of ———.  $8\frac{1}{2}$  is 10% of ———.  
 5.  $12\frac{1}{2}$  is ———% of 25.  $11\frac{1}{4}$  is ———% of 45.  
 6.  $2\frac{1}{2}$  is ———% of 5. 7 is ———% of 63.  
 7.  $3\frac{1}{3}$  is ———% of 10. 10 is ———% of 30.

8. 27 yd. of cloth shrank  $11\frac{1}{3}\%$ . It shrank — yd.
9. A grocer had a 40-lb. cheese. The waste in cutting and weighing was 10%. The waste was — lb.
10. A farmer sold 20 bu. of potatoes; these were 20% of his whole crop. He had — bushels.
11. A man having \$40 lost \$10. He had lost —% of his money.
12. A grocer had 28 lb. of coffee. 25% of it was destroyed. He had — lb. left.
13. 8 is — of 6, or — and — times 6. If 6 days' board cost \$9, 8 days' board will cost — and — times \$9, or — dollars.
14. One per cent of \$800 is —. 3% of \$800 is —.

## WRITTEN

15. Find  $11\frac{1}{3}\%$  of 928.
16. 928 is  $11\frac{1}{3}\%$  of what?
17. 16 is what per cent of 128?
18. A man having 320 bushels of grain, sold 80 bu. What per cent of his grain did he sell?
19. A father gave his son 45¢. This was  $11\frac{1}{3}\%$  of all the money he had. How much had he?
20. A man was idle 2 days out of 6. What per cent of his time was he idle?
21. If 6 tons of hay cost \$75, what will 8 tons cost?
22. If 9 tons of coal cost \$49.50, what will 12 tons cost?

XLII. RATIO, ETC. (*g*)

## ORAL

1.  $\frac{1}{7}$  of 42 is ——. 42 is  $\frac{1}{7}$  of —.
2.  $\frac{2}{7}$  of 42 are ——. 42 is  $\frac{2}{7}$  of —.
3.  $14\frac{2}{7}\%$  of 28 is ——. 28 is  $14\frac{2}{7}\%$  of —.
4.  $12\frac{1}{2}\%$  of 80 is ——. 80 is  $12\frac{1}{2}\%$  of —.
5. Since  $14\frac{2}{7}\% =$  — —,  $28\frac{4}{7}\%$  must = — —.
6. Since  $33\frac{1}{3}\% =$  — —,  $66\frac{2}{3}\%$  must = — —.
7.  $28\frac{4}{7}\%$  of 14 = ——. 14 is  $28\frac{4}{7}\%$  of —.
8.  $66\frac{2}{3}\%$  of 18 = ——. 18 is  $66\frac{2}{3}\%$  of —.
9. Since  $25\% =$  — —,  $75\%$  must = — —.
10.  $75\%$  of 24 = ——. 24 is  $75\%$  of —.
11.  $28\frac{4}{7}\%$  of 70 = ——. 70 is  $28\frac{4}{7}\%$  of —.
12.  $66\frac{2}{3}\%$  of 30 = ——. 30 is  $66\frac{2}{3}\%$  of —.
13. 18 is — — of 24. 24 is — — of 18.
14. 24 is — — of 32. 32 is — — of 24.
15. 15 is — — of 25. 25 is — — of 15.
16. 36 is — — of 48. 48 is — — of 36.
17. 18 is — —% of 24. 24 is 75% of —.
18. 24 is — —% of 36. 6 is  $66\frac{2}{3}\%$  of —.

## WRITTEN

19. Find  $14\frac{2}{7}\%$  of 2905.
21. Find  $28\frac{4}{7}\%$  of 518.
20. 2905 is  $14\frac{2}{7}\%$  of what?
22. 518 is  $28\frac{4}{7}\%$  of what?

23. Find  $66\frac{2}{3}\%$  of \$186.
24. \$186 are  $66\frac{2}{3}\%$  of what?
25. Find 75% of \$6.24.
26. \$6.24 are 75% of what?
27. Find 75% of 320 rods.
28. 320 rods are 75% of what?
29.  $\frac{7}{8}$  of 1456 are  $\frac{1}{4}$  of what?
30.  $\frac{3}{8}$  of 4872 are  $\frac{1}{2}$  of what?
31.  $\frac{2}{3}$  of 690 are  $\frac{1}{8}$  of what?
32. 16 is ——— of 12, or ——— and ——— times
12. If the rent of a house for 12 months is \$924, what is the rent for 16 months?
33. \$19.87 are  $11\frac{1}{9}\%$  of what?

### XLIII. RATIO, ETC. (h)

#### ORAL

1.  $28\frac{4}{7}\%$  of 56 = 56 is  $28\frac{4}{7}\%$  of ———. (See App. No. 3.)
2.  $66\frac{2}{3}\%$  of 36 = 36 is  $66\frac{2}{3}\%$  of ———.
3. 12 is ———% of 42.\* 12 is ———% of 18.
4. 6 is ———% of 21. 8 is ———% of 12.
5. 21 is ———% of 28. 6 is ———% of 36.
6. 8 is ———% of 64. 4 is ———% of 16.
7. 3 is ———% of 27. 5 is ———% of 15.
8. 18 is ———% of 24. 9 is ———% of 12.

\* 12 is  $(\frac{1}{3})\frac{1}{2}$  of 42 =  $28\frac{1}{3}\%$  of 42.

9. 20% of \$85 is ——— dollars.
10.  $16\frac{2}{3}\%$  of 72 bu. is ——— bushels.
11.  $12\frac{1}{2}\%$  of 9 pk. is ——— pecks.
12. \$17 are 20% of ——— dollars.
13. 12 bu. are  $16\frac{2}{3}\%$  of ——— bushels.
14.  $1\frac{1}{2}$  pk. are  $12\frac{1}{2}\%$  of ——— pecks.

Find 2% of \$48. This means find 2 hundredths of \$48.

$$\begin{array}{r} 1 \text{ per cent of } \$48 = \text{———} \quad \$48 \\ 2 \text{ per cent of } \$48 = \text{———} \quad .02 \\ \hline \quad \quad \quad \$ .96 \end{array}$$

\$36 are 2% of what? This means \$36 are 2 hundredths of how many dollars?

$$\begin{array}{r} 2 \overline{) \$36} \\ \underline{\$18} \end{array}$$

$$\$18 \times 100 = \$1800.$$

2 hundredths of the required number = \$36.

1 hundredth of the required number = \$——.

100 hundredths of the required number = \$——.

#### WRITTEN

15. Find 3% of 962.
16. Find 4% of \$845.
17. Find 5% of 680 bu.
18. Find 6% of 846 tons.
19. \$2.45 are 7% of what?
20. 2.16 tons are 3% of what?
21. 14.4 lb. are 4% of what?
22. A man lost 24 bu. of grain, losing 3% of his crop. How many bushels had he?

## XLIV. RATIO, ETC. (i)

## ORAL

1.  $\frac{1}{8}$  of 25 is ——. 25 is  $\frac{1}{8}$  of —.
2.  $\frac{3}{8}$  of 24 are ——. 24 is  $\frac{3}{8}$  of —.
3.  $\frac{1}{5}$  of 60 is ——. 60 is  $\frac{1}{5}$  of —.
4.  $\frac{2}{5}$  of 20 are ——. 20 is  $\frac{2}{5}$  of —.
5.  $\frac{3}{5}$  of 30 are ——. 30 is  $\frac{3}{5}$  of —.
6. 20% = ——. 40% = —.
7.  $12\frac{1}{2}\%$  = ——.  $37\frac{1}{2}\%$  = —.\*
8. 20% = ——. 60% = —.
9. 40% of 40 = 40 is 40% of —.
10.  $37\frac{1}{2}\%$  of 24 = 24 is  $37\frac{1}{2}\%$  of —.
11. 60% of 30 = 30 is 60% of —.
12.  $66\frac{2}{3}\%$  of 6 = 6 is  $66\frac{2}{3}\%$  of —.
13. 75% of 24 = 24 is 75% of —.
14.  $28\frac{4}{7}\%$  of 28 = 28 is  $28\frac{4}{7}\%$  of —.
15. 14 is — of 21. 21 is — of 14.
16. 15 is — of 20. 20 is — of 15.
17. 18 is —% of 27. 22 is —% of 33.
18. 27 is —% of 36. 9 is —% of 24.
19. 16 is — of 20. If 20 bu. of grain cost \$25, 16 bushels would cost — dollars.

\* Observe that  $37\frac{1}{2}$  is 3 times  $12\frac{1}{2}$ .  $12\frac{1}{2}\% = \frac{1}{8}$ .  $37\frac{1}{2}\% = \frac{3}{8}$ .



## WRITTEN

20. Find  $\frac{1}{8}$  of 846 lb.      23. 344 lb. are  $\frac{3}{8}$  of what?
21. 86 lb. are  $\frac{1}{8}$  of what?      24. Find  $37\frac{1}{2}\%$  of 360.
22. Find  $\frac{3}{8}$  of 344 lb.      25. 360 is  $37\frac{1}{2}\%$  of what?
26. If 20 acres are worth \$840, what are 16 acres worth?
27. If 16 tons of hay cost \$140, what will 20 tons cost?

## XLV. RATIO, ETC. (J)

1. 40% of 10 = 10 is 40% of \_\_\_\_.
2. 60% of 60 = 60 is 60% of \_\_\_\_.
3.  $28\frac{4}{7}\%$  of 14 = 14 is  $28\frac{4}{7}\%$  of \_\_\_\_.
4.  $66\frac{2}{3}\%$  of 42 = 42 is  $66\frac{2}{3}\%$  of \_\_\_\_.
5. 75% of 48 = 48 is 75% of \_\_\_\_.
6. 36 is \_\_\_\_ of 45. 45 is \_\_\_\_ of 36.
7. 45 is \_\_\_\_ of 54. 54 is \_\_\_\_ of 45.
8. 54 is \_\_\_\_ of 63. 63 is \_\_\_\_ of 54.
9. 6 is \_\_\_\_% of 36. 6 is \_\_\_\_% of 60.
10. 6 is \_\_\_\_% of 30. 6 is \_\_\_\_% of 16.\*
11. 6 is \_\_\_\_% of 15. 6 is \_\_\_\_% of 10.
12. 6 is \_\_\_\_% of 9. 6 is \_\_\_\_% of 8.
13.  $3\frac{1}{3}$  is \_\_\_\_% of 10.  $3\frac{1}{3}$  is \_\_\_\_% of 20.

\* 6 is  $(\frac{6}{16})\frac{1}{3}$  of 16 =  $37\frac{1}{2}\%$  of 16.

14. Jack had 48 marbles. He gave  $33\frac{1}{3}\%$  of them to Henry and  $12\frac{1}{2}\%$  of them to his sister. To both he gave — marbles.

15. \$8 are  $12\frac{1}{2}\%$  of my money. I have — dollars.

16. 20 is — of 24. If 24 oranges cost 60¢, 20 oranges will cost — cents.

17. 24 is — of 20, or — and — times 20. If 20 sheep cost \$105, 24 sheep will cost — dollars.

18. A tax collector's commission was 2% of what he collected. If he collected \$300, he should keep — dollars and pay over to the town — dollars.

#### WRITTEN

19. Find 4% of \$960.

20. \$960 are 4% of what?

21. Find  $14\frac{2}{7}\%$  of \$71.05.

22. \$71.05 is  $14\frac{2}{7}\%$  of what?

23. \$71.05 is 7% of what?

24. Find 5% of \$160.

#### XLVI. RATIO, ETC. APPLICATIONS

##### ORAL

1. 3% of \$900 = \$9 are 3% of —.

2. The waste on 800 barrels of apples was 3% by decay. The waste was — barrels.

3. A grocer lost 3% of his potatoes, losing 6 barrels. Before the loss he must have had — barrels.

4. 7% of \$600 = \$14 is 7% of —.

5. A miller ground 400 bushels of grain for a farmer and took 7% of it for toll. He took — bushels.

6. For collecting some money a collector received \$21, or 7% of the sum collected. The sum collected was — dollars.

7. 27 is —% of 45.\* 19 is —% of 57.

8. Mary has 27¢ and John 45¢. Mary has —% as much money as John.

9. I picked 7 qt. of berries and Julia picked 21 qt. I picked —% as many quarts as Julia.

10. 3 is —% of 7. 15 is —% of 35.

11. I have \$30 and father has \$70. I have — as much money as father. — equal —%.

## WRITTEN

12. A lawyer collects \$840 for me, charging me 5% of the money collected. His commission is how much? How much do I receive?

13. By charging 6%, a collector's commission was \$18.12. How much did he collect? How much did he pay over?

14. Find 5% of \$460.

15. \$460 are 5% of what?

16. Find 13% of \$750.

17. \$260 are 13% of what?

\*45 is the standard of comparison and is assumed to be 100%. 27 is  $\frac{3}{5}$  as large and, therefore,  $\frac{3}{5}$  of 100% or 60% of 45.

## XLVII. MISCELLANEOUS WORK

## WRITTEN

1. The sum of two numbers is 29.3 and one of the numbers is 12.47. What is the other number? (Lesson 10.)

2. The area of an 8-inch square is what part of a sq. ft.? (Lesson 11.)

3. The product is 234; the multiplier, 13; find the multiplicand. (Lesson 12.)

4. Multiply 16 qt. 1 pt. by 9. (Lesson 13.)

5. Divide 4 bu. 2 pk. by 6 pk. (Lesson 13.)

6. The divisor is 14 qt.; the quotient is 12; find the dividend. (Lesson 18.)

7. Name the first 5 even numbers. (Lesson 19.)

8. Name 5 prime numbers in order beginning with 13. (Lesson 20.)

9. 5, 7, 11, and 23 are the prime factors of what number? (Lesson 21.)

10. Find the prime factors of 273. (Lesson 21.)

11. Find the least common multiple of 4, 6, 8, and 12. (Lesson 23.)

12. Change  $4\frac{37}{8}$  to a mixed number. (Lesson 26.)

13. Divide 32.48 by .16. (Lesson 29.)

14. Find .8 of \$348. (Lesson 30.)

15. Find .15 of 84 tons. (Lesson 31.)

16. At \$20 a ton, what will 4500 lb. of hay cost? (Lesson 32.)

17. At 18¢ a pound, what will 40 oz. of meat cost? (Lesson 33.)

18. How many square yards in a 12-ft. square? (Lesson 34.)

19. How many cubic yards in a 6-ft. cube? (Lesson 34.)

20. Find the volume of a rectangular solid 7 in. by 8 in. by 10 in. (Lesson 35.)

21. Find 50% of 387. (Lesson 37.)

22. \$850 are  $12\frac{1}{2}\%$  of what number? (Lesson 38.)

23. \$750 are  $66\frac{2}{3}\%$  of what number? (Lesson 42.)

24. A man having \$680 spent 75% of his money. How much money had he left?

25. A farmer bought 4 cows, which were  $16\frac{2}{3}\%$  as many as he already had. How many had he before he made the purchase?

26. 54¢ is  $37\frac{1}{2}\%$  of what number?

#### **XLVIII. SIMPLE NUMBERS. (a) MULTIPLYING AND DIVIDING BY SOME MULTIPLE OF TEN**

##### **ORAL**

1. 10 times 5 are ——. 10 times 52 are ——.

2. 10 times 523 are ——. 10 times 200 are ——.

3. 10 times 5 times a number are — times the number.

4. 10 times 10 times a number are — times the number.

5. One tenth of 4 is —.  $\frac{1}{10}$  of 50 is —.

6. One tenth of 45 is —.  $\frac{1}{10}$  of 65 is —.

7. One tenth of 600 is —.  $\frac{1}{10}$  of 632 is —.

8. One fifth of 1 tenth of a number is 1 —th of the number.

9. One tenth of 1 tenth of a number is 1 —th of the number.

Multiply 68 by 50.

68 5 times 68 are —.

50 10 times 340 are —.

3400 50 times 68 are —.

Divide 745 by 50.

$50 \overline{)745}$  1 tenth of 745 is —.

14.9 1 fifth of 1 tenth of 745 is  $\frac{1}{5}$  of 74.5, or —.

10. Common multiples of 8 and 10 are —, —, —, etc.

11. The l. c. m. of 8 and 10 is —.

12. The prime factors of 65 are — and —.

13. 2, 7, and 11 are the prime factors of —.

14. 3, 5, and 13 are the prime factors of —.

15. 2, 5, and 17 are the prime factors of —.

16. The prime factors of 51 are — and —.

17. The prime factors of 57 are — and —.

## WRITTEN

*Multiply :*

$$\begin{array}{r} 18. \ 86 \\ \underline{20} \end{array}$$

$$\begin{array}{r} 19. \ 742 \\ \underline{30} \end{array}$$

$$\begin{array}{r} 20. \ 853 \\ \underline{40} \end{array}$$

$$\begin{array}{r} 21. \ 972^* \\ \underline{600} \end{array}$$

$$\begin{array}{r} 22. \ 759 \\ \underline{700} \end{array}$$

*Divide :*

$$23. \ 20 \overline{)746}$$

$$24. \ 30 \overline{)522}$$

$$25. \ 40 \overline{)732}$$

$$26. \ 600 \overline{)2646}^\dagger$$

$$27. \ 700 \overline{)9905}$$

$$28. \ 748 \text{ tons by } 90 \text{ tons.} \quad 30. \ 388 \text{ bu. by } 40.$$

$$29. \ 928 \text{ tons by } 80 \text{ tons.} \quad 31. \ 984 \text{ bu. by } 60.$$

32. Find the prime factors of 1260.

33. Find the prime factors of 165.

**XLIX. AVERAGE. MULTIPLICATION AND DIVISION**

## ORAL

1. A man paid \$6 for a calf and \$4 for a sheep. He paid \$—— for both. The average price was \$——.

2. When 7 sheep are bought for \$42, the average price is \$——.

3. The receipts of a newsboy were \$2 on Monday, \$4 on Tuesday, and \$3 on Wednesday. His average daily receipts were \$——.

\* 100 times 6 times a number = —— times the number.

† One sixth of 1 hundredth of a number = 1 ——th of the number.

4. 100 times 4 times a number are — times the number.

5. 400 times 6 are 100 times — times 6. 100 times 6 are —, and 4 times 600 are —.

6. One fourth of 1 hundredth of a number is — —th of the number.

7. Divide 984 by 400. One hundredth of 984 is — and — hundredths. 1 fourth of 9.84 is — and — hundredths.

WRITTEN

8. A dealer made sales as follows: Monday, \$60; Tuesday, \$40; Wednesday, \$45; Thursday, \$50; Friday, \$56; and Saturday, \$64. Find his average daily sales.

9. A man bought 27 horses for \$6,210. Find the average price.

10. A boy's marks were in arithmetic 80, in geography 85, in history 90, and in spelling 93. Find his average mark.

11. Multiply 85 by 400.

15. Divide 7460 by 400.\*

12. Multiply 68 by 500.

16. Divide 725 by 500.

13. Multiply 89 by 600.

17. Divide 864 by 600.

14. Multiply 341 by 700.

18. Divide 82.5 by  $16\frac{1}{2}$ .†

19. Divide 1152 cu. ft. by 128 cu. ft.

20. Divide 8640 by 270.‡

$$\begin{array}{r} 4\cancel{00} \overline{)74\cancel{6}0} \\ 18.65 \end{array}$$

† Change to halves or tenths.

‡  $\frac{1}{27}$  of one tenth of 8640.



## L. TIME BOOK

Time Book for One Week

NAME	Daily Wages	M	T	W	T	F	S	Hours	Days	Sum Earned
<i>S. Brown</i>	\$ 2.50	10	8	8	10	10	5			
<i>R. Grow</i>	3.00	10	10	10	10	10	12			
<i>A. Jones</i>	2.00	9	11	11	10	8	11			
<i>J. Keen</i>	2.40	8	9	10	10	10	12			
<i>R. Bird</i>	3.00	10	10	12	12	10	11			
<i>L. Jenkin</i>	3.50	10	10	11	11	12	10			
<i>T. Johnson</i>	2.60	12	11	0	14	10	12			

1. Make a careful copy of this time book.
2. How many hours did each man work during the week? Write the number of hours in the proper column.
3. How many days (10 hours each) did each man work? Write the number of days in the proper column.
4. How much did each man earn? Write the sum earned in the proper column.
5. How many hours' work was done each day? On Monday? On Tuesday? etc. Write the several numbers under the proper column.
6. How many hours' work was done the whole week? Write the number under the proper column.
7. How many days' work were done? Write the number under the proper column.
8. How much was earned by all during the week?

# LI. REVIEW

## ORAL

1. The first ten even numbers are —, —, —, —, —, —, —, —, —, and —.\*
2. The first ten odd numbers are —.\*
3. The first ten prime numbers are 1, 2, 3, —, —, —, —, —, —, and —.†
4. The first ten composite numbers are —.†
5. The prime factors of 28 are —, —, and —.‡
6. 2, 5, 7, and 11 are prime factors of —.‡
7. Four multiples of 3 are —, —, —, and —.§
8. Three common multiples of 2 and 3 are —, —, and —.§
9. The least common multiple of 2 and 3 is —.§

## WRITTEN

*Find the prime factors of : ‡*

10. 51; 87; 91; 105; 111.
11. 132; 195; 255; 374; 345.
12. Add six even numbers in order, beginning at 12.\*
13. Add six odd numbers in order, beginning at 13.\*
14. Add six prime numbers in order, beginning at 23.†
15. Multiply 425 by 30. ||      17. Divide 435 by 30. ||
16. Multiply 324 by 300. ¶      18. Divide 686 by 700. ¶

\* Lesson 19.

† Lesson 20.

‡ Lesson 21.

§ Lessons 22, 23.

|| Lesson 48.

¶ Lesson 49.

19. Find the cost of 60 cows at \$65 a head.
20. Find the cost of 200 horses at \$374 a head.
21. 800 acres of land were bought for \$55,648. Find the average cost per acre.
22. 90 sheep were sold for \$670.50. Find the average price per head.
23. Of what number are 5, 7, 11, 13, and 15 the prime factors?

## LII. PRINCIPLES OF ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION

### ORAL

1. The sum of two numbers is 35. If one of the numbers is 20, the other number is —.
2. The less of two numbers is 33. If their difference is 15, the greater number is —.
3. The greater of two numbers is 58. If their difference is 15, the less number is —.
4. If the multiplier is 8 and the product is 56 bu., the multiplicand is —.
 

$x$	multiplicand.
8	multiplier.
<u>56</u>	product.
5. If the multiplicand is \$23 and the product is \$92, the multiplier is —.
 

\$23	multiplicand.
$x$	multiplier.
<u>\$92</u>	product.
6. If the divisor is \$11 and the quotient is 9, the dividend is —.
 

\$11	dividend.
<u>9</u>	quotient.
7. If the dividend is \$48 and the quotient is \$6, the divisor is —.

## WRITTEN

8. The sum of two numbers is 947. If one of them is 298, what is the other?

9. Two men together weigh 273 lb. If one of them weighs 138 lb., the other weighs —.

10. The less of two numbers is 389. If their difference is 296, what is the greater number?

11. The greater of two numbers is 915. If their difference is 294, what is the less number?

12. If the multiplier is 67 and the product is 5829, what is the multiplicand?

13. If the multiplicand is \$59 and the product is \$2537, what is the multiplier?

14. If the divisor is \$67 and the quotient is 87, what is the dividend?

### LIII. COMMON FRACTIONS. ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION

## ORAL

1. Add  $\frac{3}{14}$  and  $\frac{1}{4}$ . (The l. c. m. of 14 and 4 is —.)

2. From  $12\frac{3}{14}$  subtract  $6\frac{1}{4}$ . ( $1\frac{3}{14} = \frac{1}{28}$ .  $\frac{1}{4} = \frac{7}{28}$ .)

3. Multiply  $\frac{5}{8}$  by 9. (This means —. Lesson 1, Ex. 13.)

4. Multiply  $4\frac{1}{2}$  by  $\frac{1}{5}$ . (This means find  $\frac{1}{5}$  of 9 halves.)\*

5. Multiply 15 by  $\frac{3}{4}$ . (This means —.)†

\*  $\frac{1}{5}$  of 9 halves = 9 times  $\frac{1}{5}$  of one half.  $\frac{1}{5}$  of 1 half is — tenth.  
9 times 1 tenth = — tenths.

†  $\frac{3}{4}$  of 15 =  $\frac{1}{4}$  of (3 times 15) 45 = —, or 3 times  $\frac{1}{4}$  of 15.

6. Multiply 15 by  $4\frac{3}{4}$ . (This means 4 times 15 plus  $\frac{3}{4}$  of 15.)

7. Multiply  $12\frac{1}{3}$  by  $3\frac{1}{2}$ . (This means 3 times  $12\frac{1}{3}$  plus  $\frac{1}{2}$  of  $12\frac{1}{3}$ .)

8. Divide 6 by  $\frac{4}{5}$ . (This means ——. Lesson 4, Ex. 8. Change 6 to —ths.)

9. Divide  $\frac{8}{15}$  by  $\frac{1}{6}$ . (This means ——. Change to —ths.)

10. Divide  $5\frac{1}{4}$  by  $2\frac{1}{4}$ . (This means ——. Change to —ths.)

11. Divide  $\frac{3}{4}$  by 5. (This means ——.  $1\frac{3}{4} = \frac{7}{4}$ .)\*

12. Divide  $28\frac{2}{3}$  by 5. (This means ——.  $\frac{1}{5}$  of 25 plus  $\frac{1}{5}$  of  $\frac{2}{3}$ .)

## WRITTEN

13. Add  $243\frac{3}{4}$ ,  $69\frac{1}{4}$ , and 326.

14. From  $642\frac{3}{4}$  subtract  $198\frac{1}{4}$ .†

15. Multiply  $28\frac{5}{8}$  by 9.

16. Multiply  $928\frac{1}{2}$  by  $\frac{1}{5}$ . (Divide by 5.)

17. Multiply 6493 by  $\frac{3}{4}$ .      21. Divide  $3\frac{2}{15}$  by  $\frac{1}{6}$ .

18. Multiply 84 by  $4\frac{3}{4}$ .      22. Divide  $16\frac{1}{4}$  by  $2\frac{1}{4}$ .

19. Multiply 674 by  $3\frac{1}{2}$ .      23. Divide  $926\frac{3}{4}$  by 5.

20. Divide 892 by  $\frac{4}{5}$ .      24. Divide  $2\frac{3}{5}$  by 8.

\*  $1\frac{3}{4} \div 5 = \frac{1}{5}$  of  $\frac{7}{4} = 7$  times ( $\frac{1}{5}$  of 1 fourth)  $\frac{1}{20} = \frac{7}{20}$ .

Change  $\frac{3}{4}$  and  $\frac{1}{4}$  to 28ths.

†  $642\frac{3}{4}$     28ths  
 $198\frac{1}{4}$     6 (34)  
 $443\frac{2}{4}$     7

$\frac{3}{4} = \frac{6}{8}$ .  $\frac{1}{4} = \frac{2}{8}$ . Taking 1 unit from 2 units, call it 28 twenty-eighths.

Adding 28 twenty-eighths and 6 twenty-eighths, we obtain 34 twenty-eighths.

$\frac{7}{20}$  from 34 twenty-eighths leave  $\frac{11}{20}$ .

*Add :*

$$\begin{array}{r} 25. \quad 235\frac{3}{14} \\ \quad 96\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 26. \quad 849\frac{1}{4} \\ \quad 268\frac{3}{14} \\ \hline \end{array}$$

*Subtract :*

$$\begin{array}{r} 27. \quad 842\frac{3}{14} \\ \quad 189\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 28. \quad 670\frac{3}{14} \\ \quad 96\frac{1}{4} \\ \hline \end{array}$$

*Multiply :*

$$\begin{array}{r} 29. \quad 872 \\ \quad 23\frac{2}{3} \\ \hline \end{array}$$

*Divide :*

$$30. \quad \$21\frac{1}{2}) \$26$$

$$31. \quad 5) \$624\frac{2}{3}$$

**LIV. COMMON FRACTIONS (a)****ORAL**

1.  $\frac{1}{10} + \frac{1}{15} =$  (The l.c.m. of 10 and 15 is —.)
2.  $10\frac{2}{15} - 6\frac{3}{10} =$  ( $1\frac{2}{15} = \frac{2}{30}$ ,  $\frac{3}{10} = \frac{9}{30}$ .)
3.  $\$ \frac{3}{10} \times 7 =$
4.  $\$15 \times \frac{3}{10} =$  [3 times  $\frac{1}{10}$  of \$15 or  $\frac{1}{10}$  of (3 times \$15) \$45.]
5.  $\$1\frac{3}{10} \times \frac{1}{10} =$  [ $\frac{1}{10}$  of  $\$1\frac{3}{10} = 13$  times ( $\frac{1}{10}$  of 1 tenth-dollar)  $\$ \frac{1}{100}$ .]
6.  $\$15 \times 2\frac{3}{10} =$
7.  $\$14\frac{1}{3} \times 2\frac{1}{2} =$  (This means 2 times  $\$14\frac{1}{3}$  plus  $\frac{1}{2}$  of  $\$14\frac{1}{3}$ .)
8. Divide 6 by  $\frac{3}{10}$ . (Change to —ths.)
9. Divide  $\frac{11}{15}$  by  $\frac{1}{10}$ . (Change to —ths.)
10. Divide  $2\frac{1}{5}$  by  $1\frac{1}{15}$ . (Change to —ths.)
11. Divide  $4\frac{1}{5}$  by 6. ( $4\frac{1}{5} = \frac{21}{5}$ .)
12. Divide  $20\frac{2}{3}$  by 6. ( $\frac{1}{6}$  of 18 plus  $\frac{1}{6}$  of  $2\frac{2}{3}$ .)

## WRITTEN

13. Find the sum of  $28\frac{3}{10}$ ,  $16\frac{2}{15}$ ,  $8\frac{1}{5}$ ,  $26\frac{1}{2}$ .\*
14. Find the difference of  $243\frac{2}{15}$  and  $89\frac{3}{10}$ .
15. Find the product of  $\$129\frac{3}{10}$  multiplied by 7.
16. Find the product of  $\$362$  multiplied by  $\frac{3}{10}$ .
17. Find the product of  $\$421\frac{3}{10}$  multiplied by  $\frac{1}{10}$ .
18. Find the product of  $\$653$  multiplied by  $2\frac{3}{10}$ .
19. Find the product of  $\$720\frac{1}{3}$  multiplied by  $2\frac{1}{2}$ .
20. Find the quotient of  $31\frac{1}{5}$  divided by  $\frac{1}{10}$ .
21. Find the quotient of  $26\frac{1}{5}$  divided by  $1\frac{1}{15}$ .
22. Find the quotient of  $643\frac{1}{5}$  divided by 6.

*Add:*

$$\begin{array}{r} 23. \quad 28\frac{3}{10} \\ \quad 96\frac{4}{15} \\ \hline 125\frac{2}{5} \\ \quad 84\frac{1}{3} \\ \hline \end{array}$$

*Subtract:*

$$\begin{array}{r} 24. \quad 846\frac{1}{10} \\ \quad 92\frac{4}{15} \\ \hline \\ 25. \quad 98\frac{1}{5} \\ \quad 9\frac{7}{15} \\ \hline \end{array}$$

*Multiply:*

$$\begin{array}{r} 26. \quad 612\frac{4}{5} \\ \quad 36 \\ \hline \\ 27. \quad 704\frac{9}{10} \\ \quad 24 \\ \hline \end{array}$$

*Divide:*

- |                                       |                                  |                                      |
|---------------------------------------|----------------------------------|--------------------------------------|
| 28. $4\frac{1}{5}$ qt.) <u>28</u> qt. | 31. $5\frac{1}{2}$ ) <u>2244</u> | 34. 5 lb.) <u>712</u> lb.            |
| 29. 8) <u>614</u> $\frac{3}{10}$ ft.  | 32. $3\frac{1}{2}$ ) <u>570</u>  | 35. $\$2\frac{1}{3}$ ) <u>\\$126</u> |
| 30. $4\frac{1}{2}$ ) <u>369</u>       | 33. 4) <u>7064</u>               | 36. $1\frac{1}{2}$ ¢) <u>342</u> ¢   |

$$\begin{array}{r} \text{30ths} \\ * \quad 28\frac{3}{10} \quad \overline{) 9} \\ \quad 16\frac{2}{15} \quad \overline{) 4} \\ \quad \quad 8\frac{1}{5} \quad \overline{) 6} \\ \quad \quad 26\frac{1}{3} \quad \overline{) 15} \\ \hline \quad \quad 79\frac{2}{15} \quad \overline{) 33} = 1\frac{1}{15} \end{array}$$

## LV. COMMON FRACTIONS (6)

## ORAL

1. Add  $\frac{1}{2}$  and  $\frac{1}{17}$ . (The l. c. m. of 2 and 17 is —.)
2. From  $\frac{1}{2}$  subtract  $\frac{1}{17}$ .
3. Multiply  $\frac{3}{17}$  by 6.
9. Multiply  $9\frac{1}{2}$  by  $2\frac{1}{2}$ .†
4. Multiply  $5\frac{3}{17}$  by 6.
10. Divide  $2\frac{1}{17}$  by  $\frac{2}{17}$ .
5. Multiply  $2\frac{3}{17}$  by 3.
11. Divide  $\frac{1}{2}$  by  $\frac{1}{17}$ .
6. Multiply  $2\frac{3}{17}$  by  $\frac{1}{3}$ .\*
12. Divide  $4\frac{1}{8}$  by  $2\frac{1}{10}$ .
7. Multiply 34 by  $\frac{3}{17}$ .
13. Divide  $3\frac{2}{5}$  by 3.
8. Multiply 34 by  $2\frac{3}{17}$ .
14. Divide  $34\frac{1}{17}$  by 2.

## WRITTEN

15. Find the sum of  $18\frac{1}{2}$ ,  $63\frac{1}{17}$ , and 178.
16. Find the difference of  $342\frac{1}{2}$  and  $69\frac{1}{17}$ .
17. Find the product of  $609\frac{3}{17}$  multiplied by 6.
18. Find the product of  $74\frac{3}{17}$  multiplied by 3.
19. Find the product of  $74\frac{3}{17}$  multiplied by  $\frac{1}{3}$ .
20. Find the product of 391 multiplied by  $\frac{3}{17}$ .
21. Find the product of 391 multiplied by  $9\frac{3}{17}$ .
22. Find the product of  $342\frac{1}{2}$  multiplied by  $2\frac{1}{2}$ .
23. Find the quotient of  $8\frac{1}{17}$  divided by  $\frac{2}{17}$ .
24. Find the quotient of  $8\frac{1}{2}$  divided by  $\frac{2}{17}$ .
25. How many days will it take to travel  $314\frac{1}{2}$  miles at the rate of  $18\frac{1}{2}$  miles per day?

\*  $\frac{1}{3}$  of  $\frac{3}{17} = 37$  times ( $\frac{1}{3}$  of  $\frac{1}{17}$ )  $\frac{1}{17} = \frac{1}{17}$ .† 2 times  $9\frac{1}{2}$  plus  $\frac{1}{2}$  of  $9\frac{1}{2}$ .



## LVI. REDUCTION OF COMMON FRACTIONS

1. Change to lowest terms:  $\frac{15}{35} = \frac{3}{7}$ ,  $\frac{18}{27} = \frac{2}{3}$ ,  $\frac{21}{57} = \frac{7}{19}$ ,  $\frac{25}{45} = \frac{5}{9}$
2. Change to improper fractions:  $6\frac{3}{4} = \frac{27}{4}$ ,  $8\frac{2}{3} = \frac{26}{3}$ ,  $9\frac{7}{8} = \frac{75}{8}$   
 $5\frac{4}{9} = \frac{49}{9}$
3. Change to whole or mixed numbers:  $\frac{55}{7} = 7\frac{6}{7}$ ,  $\frac{16}{3} = 5\frac{1}{3}$   
 $\frac{29}{5} = 5\frac{4}{5}$ ,  $\frac{85}{9} = 9\frac{4}{9}$
4. Change 9 to a fraction whose denominator is 5.  
 This means change 9 to fifths.  $9 = \frac{45}{5}$  fifths.
5.  $\frac{3}{4}$  of a mile are ——— rods.
6.  $\frac{2}{3}$  of a minute are ——— seconds.
7.  $\frac{4}{5}$  of an hour are ——— minutes.
8.  $\frac{5}{6}$  of a day are ——— hours.
9.  $\frac{2}{5}$  of a year are ——— days.
10.  $\frac{3}{7}$  of a week are ——— days.
11.  $\frac{3}{4}$  of a bushel are ——— pecks.
12.  $\frac{3}{4}$  of a peck are ——— quarts.
13.  $\frac{1}{2}$  of a quart is ——— pint.
14.  $\frac{1}{2}$  mi. + 40 rods = ——— rods.
15.  $\frac{1}{4}$  pk. + 3 qt. = ——— quarts.

## WRITTEN

16. Change to lowest terms:  $\frac{102}{153}$ ,  $\frac{85}{170}$ ,  $\frac{170}{306}$ .
17. Change to improper fractions:  $23\frac{5}{6}$ ,  $49\frac{3}{11}$ ,  $67\frac{4}{5}$ .
18. Change to whole or mixed numbers:  $\frac{932}{11}$ ,  $\frac{845}{17}$ ,  $\frac{623}{89}$ .

19. Change 209 to a fraction whose denominator is 27.
20. Change  $\frac{7}{9}$  mi. to rods.
21. A balloon traveling  $28\frac{3}{8}$  mi. per hour will go how far in 9 hours? 12 hours? 24 hours?  $\frac{3}{4}$  hour?
22. At \$7 a head, how many sheep can be bought for \$1428?
23. At  $\$ \frac{7}{8}$  apiece, how many hens can be bought for \$308?
24. At  $\$ 2\frac{3}{4}$  a yard, how many yards can be bought for \$407?
25. The sum of two numbers is 89; one of them is 54. Find the other.
26. The sum of two fractions is  $\frac{5}{6}$ ; one of them is  $\frac{3}{4}$ . Find the other.

## LVII. REVIEW

### ORAL

1. Name three proper fractions. (Lesson 26.)
2. Name three improper fractions. (Lesson 26.)
3. Name three mixed numbers. (Lesson 26.)
4. Name the terms of these fractions:  $\frac{2}{3}$ ,  $\frac{4}{5}$ ,  $\frac{6}{7}$ . (Lesson 26.)
5. Change these fractions to whole numbers:  $\frac{27}{3}$ ,  $\frac{45}{5}$ ,  $\frac{75}{5}$ .
6. Change these fractions to mixed numbers:  $\frac{21}{4}$ ,  $\frac{17}{2}$ ,  $\frac{29}{5}$ .

7. Name three fractions that have a common denominator. (Lesson 25.)

8. Name three fractions that do not have a common denominator. (Lesson 25.)

9. Change 11 to a fraction whose denominator is 7. (Lesson 56.)

10. Change 7 to a fraction whose denominator is 9.

11. Jacob gave  $\frac{1}{2}$  of his apples to Sarah and  $\frac{1}{4}$  of them to Julia, and had 3 apples left. Before he gave any away, he had — apples.

12. A woman spent  $\$1\frac{1}{2}$  for eggs, paying  $\$ \frac{3}{8}$  per dozen. She bought — dozen.

13. Find the cost of  $2\frac{1}{2}$  tons of hay at  $\$8\frac{1}{2}$  a ton.  $2\frac{1}{2}$  times  $\$8\frac{1}{2}$  means 2 times  $\$8\frac{1}{2}$  and  $\frac{1}{2}$  of  $\$8\frac{1}{2}$ . The hay cost — dollars.

#### WRITTEN

14. Change to whole or mixed numbers:  $\frac{197}{15}$ ,  $\frac{983}{21}$ ,  $\frac{604}{17}$ .

15. Change 36 to a fraction having 28 for its denominator.

16. A farmer sold  $\frac{3}{4}$  of his wheat and had  $\frac{1}{8}$  of it made into flour. He had 140 bushels left. How much wheat had he at first?

17. At  $\$ \frac{3}{8}$  a dozen, how many dozen eggs can be bought for  $\$24$ ?

18. Find the cost of  $18\frac{1}{2}$  tons of hay at  $23\frac{1}{2}$  dollars a ton.

19. Find  $\frac{2}{5}$  of  $\$510$ .  $\$510$  are  $\frac{2}{5}$  of what?

## LVIII. DECIMALS. MULTIPLICATION AND DIVISION

## WRITTEN

1.  $\$347 \times 2.35$  means find 2 times  $\$347$  plus 3 tenths of  $\$347$  plus 5 hundredths of  $\$347$ .

$\$347$  1 hundredth of  $\$347 = \$3.47$

2.35 5 hundredths of  $\$347 = 5$  times  $\$3.47 = \$17.35$

17 35 1 tenth of  $\$347 = \$34.7$

104 1 3 tenths of  $\$347 = 3$  times  $\$34.7 = \$104.1$

694 2 times  $\$347 = \$694.$

$\$815.45$   $\$17.35 + \$104.1 + \$694 = \$815.45$

How many decimal places in the multiplier and multiplicand together? How many in the product?

2. Multiply  $\$605$  by  $3.57$ .

3. When wheat bran is worth  $\$27$  a ton, how much must be paid for 8460 lb.? (8460 lb. = — tons.)

4. At  $\$23$  a ton, what will 9260 lb. of hay cost?

5. What must be paid for 7480 lb. of corn meal at  $\$28$  a ton?

6. .1 of  $\$4$  is —. .1 of  $\$3.45$  is —. .01 of  $\$4$  is —. .01 of  $\$3.45$  is —.  $\$.0345$  is read 3¢, 4 mills, and 5 tenths of a mill, or 345 ten-thousandths of a dollar.

7. Read both ways:  $\$.0635$ ,  $\$.2065$ ,  $\$.3502$ .

8. How many tons in 5680 lb.?

9. At 3¢ a pound, how many pounds of feed can be bought for  $\$172.32$ ?

10. Find the cost of 2.8 tons of feed at 2¢ a pound.

## WRITTEN

11. Multiply \$2.38 by 2.25.

\$2.38	.01 of \$2.38 = \$.0238	
2.25	.05 of \$2.38 = 5 times \$.0238 =	\$.1190
1190	.1 of \$2.38 = \$.238	
476	.2 of \$2.38 = 2 times \$.238 =	\$.476
476	2 times \$2.38	= \$4.76
\$5.3550	\$ .1190 + \$.476 + \$4.76	= \$5.3550

How many decimal places in the multiplier and multiplicand together? How many in the product?

12. Multiply \$9.24 by 2.34.      17. Multiply \$2.39 by 1.84.

13. Multiply \$7.31 by 2.91.      18. Multiply \$8.42 by 3.24.

14. Add .426 and 9.314.      19. 7.62 - .048.

15. From .64 subtract .297.      20. \$.8)\$36.

16. Divide \$62 by \$.4.      21. 8)\$36.

## LIX. DIVISION OF DECIMALS

1. Divide .56 by .08. 8 hundredths are contained in 56 hundredths — times.

2. Divide 6 by .04. 4 hundredths are contained in 600 (6.00) hundredths — times.

3. Divide 3.2 by .08. 8 hundredths are contained in 320 (3.20) hundredths — times.

4. At \$.06 apiece, for \$.54 I can buy — pencils.

5. At \$.04 apiece, for \$6 I can buy — pencils.

6. At \$.08 a half-pint, for \$3.2 I can buy — half-pints of cream.

7. Divide \$.72 by 9. One ninth of \$.72 is —.

8. Divide \$2.45 by 7. (State the meaning. See 7th example.)

WRITTEN \*

9. Divide 38.07 by .09. (See Ex. 1.)

10. Divide 27 by .25. (See Ex. 2.)

11. Divide 82 by .25. (See Ex. 2.)

12. Divide 159.6 by .35.

13. Divide 296.1 by .35.

14. Divide 25.2 by 3.5.

15. Divide 18.75 by 25. (See Ex. 7.)

16. Divide \$23.36 by \$4. (Make a practical application.)

17. Divide \$73.98 by \$.09.

18. At \$.35 apiece, how many hens can be bought for \$259.05?

19. If \$191.25 were equally distributed among 45 men, how much would each receive?

LX. DIVISION

1. Divide .39 by .13. 13 hundredths are contained in 39 hundredths — times.

2. Divide 2.15 by .05. 5 hundredths are contained in 215 hundredths — times.

\* By knowing the meaning of each example the pupil is to determine where to place the decimal point.

3. Divide 7 by .2. 2 tenths are contained in 70 (7.0) tenths — times.

4. Divide 7 by .04. 4 hundredths are contained in 700 (7.00) hundredths — times.

5. Divide 3.6 by .18. 18 hundredths are contained in 360 (3.60) hundredths — times.

6. Divide \$.54 by 9. — — of \$.54 is —.

7. Divide .018 by .006. — thousandths are contained in — thousandths — times.

8. Divide 6 by .003. — thousandths are contained in — thousandths — times.

9. Divide \$.252 by 3. — — of 252 thousandths of a dollar is — thousandths of a dollar.

## WRITTEN

- |   |                            |
|---|----------------------------|
| 10. Divide \$1848 by \$14.                | 13. Divide \$462 by 7.     |
| 11. Divide \$58.68 by \$.12.              | 14. Divide \$28.16 by 4.   |
| 12. Divide \$276.5 by \$3.5.              | 15. Multiply \$21.3 by .5. |
| 16. Multiply \$213 by .05.                |                            |
| 17. Multiply \$1.43 by 1.25. (Lesson 58.) |                            |
| 18. Divide 6.036 by .012.                 | 22. Divide .23 by .005.    |
| 19. Divide 12 by .004.*                   | 23. Divide 1.05 by .035.   |
| 20. Divide 28.12 by .004.†                | 24. Divide 2.128 by 4.     |
| 21. Divide 16.4 by .002.                  | 25. $829.8 \div 9$ .       |

\* Find how many times 4 thousandths are contained in 12000 thousandths.

† Find how many times 4 thousandths are contained in 28120 thousandths.

## LXI. REDUCTION OF COMMON FRACTIONS TO DECIMALS

## ORAL

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| 1. $\frac{1}{2}$ = ——— tenths.   | 9. $\frac{2}{3}$ = ——— tenths.†   |
| $\frac{1}{2}$ = ——— hundredths.  | $\frac{2}{3}$ = ——— hundredths.†  |
| $\frac{1}{2}$ = ——— thousandths. | $\frac{2}{3}$ = ——— thousandths.† |
| 2. $\frac{1}{3}$ = ——— tenths.*  | 10. $\frac{3}{4}$ = ——— tenths.   |
| $\frac{1}{3}$ = ——— hundredths.  | $\frac{3}{4}$ = ——— hundredths.   |
| $\frac{1}{3}$ = ——— thousandths. | $\frac{3}{4}$ = ——— thousandths.  |
| 3. $\frac{1}{4}$ = ——— tenths.   | 11. $\frac{2}{5}$ = ——— tenths.   |
| $\frac{1}{4}$ = ——— hundredths.  | $\frac{2}{5}$ = ——— hundredths.   |
| $\frac{1}{4}$ = ——— thousandths. | $\frac{2}{5}$ = ——— thousandths.  |
| 4. $\frac{1}{5}$ = ——— tenths.   | 12. $\frac{3}{5}$ = ——— tenths.   |
| $\frac{1}{5}$ = ——— hundredths.  | $\frac{3}{5}$ = ——— hundredths.   |
| $\frac{1}{5}$ = ——— thousandths. | $\frac{3}{5}$ = ——— thousandths.  |
| 5. $\frac{1}{6}$ = ——— tenths.   | 13. $\frac{4}{5}$ = ——— tenths.   |
| $\frac{1}{6}$ = ——— hundredths.  | $\frac{4}{5}$ = ——— hundredths.   |
| $\frac{1}{6}$ = ——— thousandths. | $\frac{4}{5}$ = ——— thousandths.  |
| 6. $\frac{1}{7}$ = ——— tenths.   | 14. $\frac{5}{6}$ = ——— tenths.   |
| $\frac{1}{7}$ = ——— hundredths.  | $\frac{5}{6}$ = ——— hundredths.   |
| $\frac{1}{7}$ = ——— thousandths. | $\frac{5}{6}$ = ——— thousandths.  |
| 7. $\frac{1}{8}$ = ——— tenths.   | 15. $\frac{2}{7}$ = ——— tenths.   |
| $\frac{1}{8}$ = ——— hundredths.  | $\frac{2}{7}$ = ——— hundredths.   |
| $\frac{1}{8}$ = ——— thousandths. | $\frac{2}{7}$ = ——— thousandths.  |
| 8. $\frac{1}{9}$ = ——— tenths.   | 16. $\frac{3}{8}$ = ——— tenths.   |
| $\frac{1}{9}$ = ——— hundredths.  | $\frac{3}{8}$ = ——— hundredths.   |
| $\frac{1}{9}$ = ——— thousandths. | $\frac{3}{8}$ = ——— thousandths.  |

\*  $\frac{1}{3}$  =  $\frac{1}{3}$  of 1.0, or .3 $\frac{1}{3}$ .  $\frac{1}{3}$  =  $\frac{1}{3}$  of 1.00, or .33 $\frac{1}{3}$ .†  $\frac{2}{3}$  =  $\frac{2}{3}$  of 2, or  $\frac{1}{3}$  of 2.0.  $\frac{2}{3}$  =  $\frac{2}{3}$  of 2, or  $\frac{1}{3}$  of 2.00.  $\frac{2}{3}$  =  $\frac{2}{3}$  of 2, or  $\frac{1}{3}$  of 2.000.



## WRITTEN

17. Write all of the above thus: (App. No. 5.)

$$\frac{1}{2} = .5. \quad \frac{1}{2} = .50. \quad \frac{1}{2} = .500. \quad \frac{1}{3} = .3\bar{1}. \quad \frac{1}{3} = .33\bar{1}. \quad \frac{1}{3} = .333\bar{1}.$$

18. What is the cost of 9.5 tons of hay at \$12.25 a ton?

19. How many tons of hay can be bought for \$87.02, if each ton costs \$8.40?

20. If 64 tons of hay cost \$617.60, what is the price per ton?

21. At 23¢ a dozen, how many dozen eggs can be bought for \$16.56?

22. Multiply \$73 by .9.                      26. Divide \$536 by 8.

23. Multiply \$348 by .07.                    27. Divide \$536 by \$.8.

24. Multiply \$348 by 2.07.                  28. Divide \$536 by .08.

25. Multiply \$348 by .032.                  29. Divide \$536 by \$8.

## LXII. REDUCTION OF DECIMALS TO COMMON FRACTIONS

## ORAL

1. Change to decimals:  $\frac{1}{2} =$      $\frac{1}{5} =$      $\frac{1}{7} =$  (thousandths).

2.  $\frac{2}{5} =$      $\frac{3}{5} =$      $\frac{4}{5} =$      $\frac{1}{3} =$      $\frac{2}{3} =$

*Change to common fractions and reduce to lowest terms:*

3. .4 =    .6 =    .8 =    .25 =    .75 =    .2 =     $.3\frac{1}{3} =$

4. .15 =     $.12\frac{1}{2} =$     ( $12\frac{1}{2}$  will divide both numerator and denominator.)

5.  $.33\frac{1}{3} = .66\frac{2}{3} = .5 = .11\frac{1}{9} = .05 =$

6. Multiply \$20 by .9. ——— of \$20 = (Lesson 30.)

7. Multiply \$30 by .8. ——— of \$30 =

8. Multiply \$300 by .09. ——— of \$300 =

9. Multiply \$300 by .08. ——— of \$300 =

10. Multiply \$5000 by .007. ——— of \$5000 =

11. Divide \$64 by 8. ——— of \$64 =

12. Divide \$64 by \$.8. \$.8 are contained in \$64.0 ——— times.

13. Divide \$64 by \$.08. \$.08 are contained in \$64 ——— times.

14. Divide .405 by .005. 5 thousandths are contained in 405 thousandths ——— times.

# WRITTEN

*Change to decimals :*

15.  $\frac{4}{7}.*$                       17.  $\frac{3}{7}.$                       19.  $\frac{6}{7}.$                       21.  $\frac{1}{8}.$

16.  $\frac{5}{8}.\dagger$                       18.  $\frac{5}{7}.$                       20.  $\frac{2}{3}.$                       22.  $\frac{3}{8}.$

*Change to common fractions in their lowest terms :* (App. No. 6.)

23. .15.                      25. .625.                      27. .375.                      29. .175.

24. .125.                      26. .875.                      28. .425.                      30. .675.

\*  $\frac{4}{7} = \frac{1}{7}$  of 4.  $4 = 4.0$  (40 tenths) = 4.00 (400 hundredths) = 4.000 (4000 thousandths).  $\frac{1}{7}$  of 4 =  $\frac{1}{7}$  of 4.000.  $7 \overline{)4.000}$

.571 $\frac{4}{7}$  or .571+

$\dagger \frac{5}{8} = \frac{1}{8}$  of 5.  $5 = 5.000$ .  $\frac{1}{8}$  of 5.000.  $8 \overline{)5.000}$   
.625 $\frac{1}{8}$  or .625+

31. Multiply \$784 by .006.      35. Divide \$825 by \$6.  
 32. Multiply \$784 by 9.06.      36. Divide \$825 by 6.  
 33. Multiply \$784 by 2.16.      37. Divide \$825 by \$.6.  
 34. Multiply \$784 by .016.      38. Divide \$825 by \$.06.  
 39. What will 9.3 tons of coal cost at \$5.35 per ton?  
 40. For \$52.65, how many tons of coal can be bought if the price is \$6.75 per ton?

### LXIII. MULTIPLICATION OF DECIMALS

#### ORAL

1. 2.3 tons of hay at \$20 a ton will cost — dollars.  
 2.3 times \$20 equal 2 times \$20 plus .3 of \$20.  
 2. 4.1 tons of bran at \$30 a ton will cost — dollars.  
 4.1 times \$30 equal 4 times \$30 plus .1 of \$30.  
 3. 3.05 tons of hay at \$20 a ton will cost — dollars.  
 3.05 times \$20 equal 3 times \$20 plus .05 of \$20.

#### WRITTEN

(a) Find the cost of 2.35 acres of land at \$345.

\$345	.01 of an acre costs .01 of \$345	=	\$3.45
2.35	.05 of an acre costs 5 times \$3.45	=	\$17.25
1725	.1 of an acre costs .1 of \$345	=	\$34.5
1035	.3 of an acre costs 3 times \$34.5	=	\$103.5
690	2 acres cost 2 times \$345	=	\$690
<u>\$810.75</u>	\$17.25 + \$103.5 + \$690	=	<u>\$810.75</u>

How many decimal places in multiplier and multiplicand together? How many in the product?

(b) Find the cost of 23.8 acres of land at \$34.5.

\$34.5			
23.8	.1 of an acre costs .1 of	\$34.5 = \$3.45	
2760	.8 of an acre costs 8 times	\$3.45 =	\$27.60
1035	3 acres cost 3 times	\$34.5 =	\$103.5
690	20 acres cost 20 times	\$34.5 =	\$690
\$821.10	\$27.60 + \$103.5 + \$690	=	\$821.10

How many decimal places in the multiplier and multiplicand together? How many in the product?

Find the cost of:

4. 3.48 acres of land at \$345.
5. 6.71 acres of land at \$345.
6. 1.29 acres of land at \$345.
7. 2.38 acres of land at \$34.5.
8. 238 acres of land at \$34.5.
9. 9.28 acres of land at \$83.6.
10. 92.8 acres of land at \$8.36.

#### LXIV. MULTIPLICATION AND DIVISION OF DECIMALS

##### ORAL

- |                            |                               |                                  |
|----------------------------|-------------------------------|----------------------------------|
| 1. $2)\underline{4.16}$    | 7. $2)\underline{.0416}$      | 13. $.2)\underline{416.0}$       |
| 2. $.2)\underline{4.16}$   | 8. $.2)\underline{.0416}$     | 14. $.02)\underline{416.00}$     |
| 3. $.02)\underline{4.16}$  | 9. $.02)\underline{.0416}$    | 15. $.002)\underline{416.000}$   |
| 4. $.2)\underline{.416}$   | 10. $.002)\underline{.0416}$  | 16. $.0002)\underline{416.0000}$ |
| 5. $.02)\underline{.416}$  | 11. $.0002)\underline{.0416}$ | 17. $.03)\underline{537}$        |
| 6. $.002)\underline{.416}$ | 12. $.02)\underline{41.60}$   | 18. $.003)\underline{537}$       |

## WRITTEN

19.  $8 \overline{)3.68}$

20.  $.8 \overline{)3.68}$

21.  $.08 \overline{)3.68}$

22.  $.08 \overline{).368}$

23.  $.008 \overline{).368}$

24.  $.8 \overline{).368}$

25.  $8 \overline{).0368}$

26.  $.08 \overline{).0368}$

27.  $.008 \overline{).0368}$

28.  $.0008 \overline{).0368}$

29.  $.8 \overline{)368}$

30.  $.08 \overline{)368}$

31.  $8 \overline{)368}$

32.  $.008 \overline{)368}$

33.  $\$4025 \times 2.05.$

36.  $\$5.29 \times 3.01.$

34.  $\$603 \times 4.2.$

37.  $\$1.04 \times 9.7.$

35.  $\$6.03 \times 9.1.$

38.  $1.86 \div .03.$

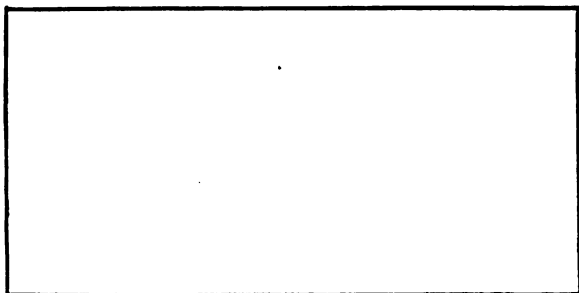
39. If a farmer has 140 acres of land and his neighbor has only .9 as much, how much has his neighbor?

40. At \$4.5 a ton, how many tons of coal can be bought \$103.5?

NOTE. — When both the divisor and the dividend are abstract numbers, division of decimals *may* always mean, find how many times the divisor is contained in the dividend.

The *whole* number in the quotient is complete when that figure of the dividend has been used which is of the same denomination as the right-hand figure of the divisor. The pupil may denote the location of the decimal point as indicated in examples 8 and 9 before beginning to divide.

## LXV. WEIGHTS AND MEASURES (a)



## WRITTEN

Scale,  $\frac{1}{8}$  inch to 1 rod.

1. How many rods long is the land represented above?
2. How many rods wide?
3. Find the area of the land in square rods.
4. Find the area in acres. (160 square rods = 1 acre.)
5. Find the area of the *figure* in square inches.
6. How many square rods are represented by one square inch?
7. Represent a rectangular piece of land 32 rods long and 4 rods wide, using the scale of  $\frac{1}{8}$  inch to the rod.
8. How many square rods are there?
9. How many acres are there?
10. How many rods of fence will be required to inclose the field represented first?
11. What will it cost to build the fence at \$1.40 a rod?

12. How many rods of fence will be required to inclose the second field?

13. What will this fence cost at \$1.80 a rod?

14. How many acres in a rectangular surface 40 rods long and 20 rods wide?

15. Find the volume of a rectangular solid 12 ft. by 9 ft. by 6 ft.

16. Find the volume of a 2-foot cube.

17. Find the area of the six faces of a 2-foot cube.

18. Find the volume of a 3-ft. cube.

19. Find the area of the six faces of a 3-ft. cube.

## LXVI. WEIGHTS AND MEASURES (6)

### ORAL

1. 33 feet are — rods.
2. 100 feet are — rods and — feet.
3. 200 feet are — rods and — feet.
4. 300 feet are — rods and — feet.
5. A strip of land  $\frac{1}{4}$  mile long and 1 rod wide is — of an acre. (See Lesson 65, Ex. 4.)
6. Land  $\frac{1}{2}$  mile long and 1 rod wide is — —.
7. Land 1 mile long and 1 rod wide is — —.
8. Land 2 rods wide and — rd. long is one acre.
9. Land 4 rd. wide and — rd. long is one acre.
10. Land 5 rd. wide and — rd. long is one acre.

11. Land 5 rd. by 16 rd. is ——— of an acre.
12. Land 5 rd. by 20 rd. is ——— of an acre.
13. 1600 lb. are ——— of a ton.
14. 1800 lb. are ——— of a ton.
15. 32 oz. are ——— pounds.
16. 4 pounds are ——— ounces.

## WRITTEN (App. No. 7)

17. Change 15 miles to rods.
21. Change 9680 lb. to tons.
18. Change 1920 rd. to miles.
22. Change 80 rd. to feet.
19. Change 50 rd. to yards.
23. Change 1920 in. to feet.
20. Change 7840 lb. to tons.
24. Change 2200 yd. to rods.
25. How many cords in a pile of wood 4 ft. by 4 ft. by 24 ft.

NOTE. — Of a pile of wood 4 ft. wide and 4 ft. high, every 8 ft. in length is a cord.

## LXVII. WEIGHTS AND MEASURES (c)

## ORAL

1. 5280 feet are one mile.  $\frac{1}{2}$  mile is ——— feet.
2. 2 miles are ——— rd. 2 acres are ——— square rods.
3. 60 feet are ——— yards. 28 feet are ——— yards.
4. A pile of wood 8 ft. by 4 ft. by 4 ft. contains ——— cubic feet. It is a ———.
5. 64 cu. ft. are ——— of a cord.
6. 16 cu. ft. are ——— of a cord.



## WRITTEN

7. Change 5 mi. to feet.
8. Change 4 acres to sq. rods.
9. Change 23 mi. to rods.
10. Change 24 acres to sq. rods.

*How many acres in land :*

- |                         |                        |
|-------------------------|------------------------|
| 11. 28 rd. by 40 rd. ?  | 14. 36 rd. by 50 rd. ? |
| 12. 32 rd. by 64 rd. ?  | 15. 72 rd. by 48 rd. ? |
| 13. 18 rd. by 100 rd. ? | 16. 54 rd. by 36 rd. ? |

*How many cords in a pile of wood :*

- |                                |                                 |
|--------------------------------|---------------------------------|
| 17. 8 ft. by 4 ft. by 8 ft. ?  | 20. 8 ft. by 12 ft. by 16 ft. ? |
| 18. 12 ft. by 4 ft. by 8 ft. ? | 21. 8 ft. by 12 ft. by 8 ft. ?  |
| 19. 16 ft. by 4 ft. by 4 ft. ? | (App. No. 8.)                   |

## LXVIII. WEIGHTS AND MEASURES (d)

## ORAL

1. 12 dozen are one gross. One gross of pens are — pens.
2. 2 gross of clothespins are — clothespins.
3. 24 sheets of paper are one quire. A quire of paper at 2¢ a sheet will cost — cents.
4. 5 quires of paper are — sheets.
5. 48 sheets of paper at 6¢ a quire are worth — cents.
6. 72 sheets of paper at 10¢ a quire are worth — nts.

7. 20 quires of paper are one ream. A ream of paper is — sheets.

8.  $\frac{1}{2}$  of a ream is — sheets.

9.  $\frac{1}{4}$  of a ream is — sheets.

10.  $\frac{1}{2}$  of a ream is — quires.

11.  $\frac{1}{4}$  of a ream is — quires.

12. A ream of paper at 2¢ a sheet will cost —.

13. A ream of paper at  $1\frac{1}{2}$ ¢ a sheet will cost —.

14. A 3-ft. cube contains — cu. ft. It is a — —.

15. An excavation 9 ft. by 2 ft. by 3 ft. required the removal of — cu. yd.

## WRITTEN

16. Change 24 gross to dozen.

17. Change 600 sheets to quires.

18. Change 2400 sheets to reams.

19. Change  $\frac{3}{8}$  mi. to feet.\*

20. Change  $5\frac{1}{4}$  acres to square rd.

21. Change 6 mi. to feet.

22. Change  $6\frac{3}{8}$  acres to sq. rd.

23. Change 7 mi. to feet.

24. How many cu. yd. in a solid 6 ft. by 9 ft. by 12 ft.?

25. How many cords in a pile 8 ft. by 12 ft. by 16 ft.?

26. How many acres in land 40 rd. by 12 rd.?

\* Lesson 67, Ex. 1.

## LXIX. BILLS

1. Copy and complete this bill :

NEW YORK, N.Y., May 31, 1903.

MR. JAMES SPAULDING,

*Bought of* JOHN REESE & Co.

May	4	1½ lb. Tea	@ \$.60			
"	5	5 lb. Butter	@ .28			
"	5	10 lb. Sugar	@ .05½			
"	8	5 pkg. Oat Meal	@ .12			
"	12	1 bbl. Flour	@	5	75	
		<i>Received Payment,</i>				amount here

2. Receipt the bill thus: Sign under the words "Received Payment" the firm name, and under the firm name the initials of your own name.

## ORAL

- 1000 lb. are ——— of a ton.
- 1000 feet are ——— yards and ——— foot.
- 1000 feet are nearly ——— of a mile.
- 1000 sq. rd. are ——— and ——— acres.
- 1000 sheets are ——— reams and ——— sheets.
- 1000 feet are ——— rods and ——— feet.
- Land 4 rd. by 20 rd. at \$200 an acre is worth ——— dollars.

## WRITTEN

10. Find the cost of land 40 rd. by 12 rd. at \$34.60 an acre.
11. Change 29 acres to square rods.
12. Change 29 miles to rods.
13. Change 4480 sq. rd. to acres.
14. Change 5120 rd. to miles.

## LXX. WEIGHTS AND MEASURES (o)

## ORAL

1. Land 10 rd. by 12 rd. contains ——— of an acre.
2. Land 10 rd. by 15 rd. contains ——— of an acre.
3. Land 15 rd. by 20 rd. contains ——— acres.
4. Land 10 rd. by 32 rd. contains ——— acres.
5. At 60¢ a gross, a dozen buttons cost ——— cents.
6. At 72¢ a gross, a dozen pens cost ——— cents.
7. At 48¢ a gross, a dozen pens cost ——— cents.
8. At 80¢ a gross, 6 dozen pens cost ——— cents.
9. When coal is \$7 a ton, 5000 lb. cost ——— dollars.
10. The perimeter of a 3-ft. square is ——— feet.
11. The area of a 3-ft. square is ——— sq. ft.
12. The volume of a 3-ft. cube is ——— cu. ft.
13. The entire surface of a 3-ft. cube is ——— sq. ft.

## WRITTEN

14. Suppose the following articles to have been sold by you to William Williams. Make out the bill and receipt it.

June 3, 1 pr. shoes @ \$2.50; June 3, 2 pr. rubbers @ \$.45; June 5, 1 box blacking @ 15¢; June 8, 4 pr. shoestrings @ \$.05; June 10, 2 shoe horns @ \$.18. (Lesson 69.)

15. How much is the profit on 2 gross of pens costing 60¢ each, and sold at the rate of 2 pens for a cent?

16. Multiply 54 sq. ft. by 27, and divide the product by 9 sq. ft. Give a practical application. (App. No. 9.)

17. Find the volume of a 6-foot cube.

18. Find the entire surface of a 6-foot cube.

19. How many square yards in a rectangle 28 ft. by 33 ft.?

## LXXI. PERIMETER, AREA, AND VOLUME

## ORAL

1. The perimeter of a rectangle 4 ft. by 6 ft. is ——— feet.

2. The area of a rectangle 4 ft. by 6 ft. is ——— square feet.

3. The perimeter of a 5-foot square is ——— feet.

4. The area of a 5-foot square is ——— square feet.

5. The volume of a 4-foot cube is ——— cu. ft.

6. The entire surface of a 4-foot cube is ——— sq. ft.

7. The volume of a 5-foot cube is ——— cu. ft.

8. The entire surface of a 5-foot cube is ——— sq. ft.
9. The volume of a 6-foot cube is ——— cu. ft.
10. The entire surface of a 6-foot cube is ——— sq. ft.
11. At \$20 a ton, 1 cwt. (hundredweight) of oil meal is worth ———.
12. At 70¢ a cwt., a ton of hay is worth ———.
13. At 35¢ a cwt.,  $\frac{1}{2}$  ton of clover hay is worth ———.
14. At 80¢ a cwt.,  $\frac{1}{4}$  ton of bran is worth ———.
15. At \$3.20 a cwt., 50 lb. of flour are worth ———.
16. At \$2.80 a cwt., 25 lb. of flour are worth ———.
17. At 30¢ a pound, 4 oz. of butter are worth ———.
18. At 40¢ a dozen, 18 eggs are worth ———.
19. At 36¢ a dozen, 20 eggs are worth ———.
20. At 90¢ a gross, 72 pens are worth ———.

## WRITTEN

21. Find the perimeter of a rectangle 28 ft. by 92 ft.
22. Find the area of a rectangle 28 ft. by 92 ft.
23. Find the perimeter of a 63-ft. square.
24. Find the area of a 63-ft. square.
25. Find the volume of a 7-foot cube.
26. Find the entire surface of a 7-foot cube.
27. At \$1.20 a cwt., how much will 1240 lb. cost?
28. At \$2.40 a cwt., how much will 1840 lb. cost?
29. At 75¢ a cwt., how much will  $\frac{3}{4}$  ton cost?

## LXXII. MISCELLANEOUS

1. M stands for one thousand. 5000 brick at \$7 per M will cost —.

2. 1400 lath at \$4 per M cost —.

3. 1800 lb. hay at \$20 per ton cost —.

4. 800 lb. pork at \$6 per cwt. cost —.

5. 900 lb. beef at \$7 per cwt. cost —.

6. 1200 lb. coal at \$6 per ton cost —.

7. 400 brick at \$5 per M cost —.

8. At \$1 per ream, a quire will cost —.

9. By buying paper at \$2.40 a ream and selling at 1¢ a sheet, I can gain —.

10. At 10¢ a quire, 48 sheets will cost —.

11. At 10¢ a quire, a ream will cost —.

12. At 60¢ per gross, 72 buttons will cost —.

13. At 80¢ per gross, 36 buttons will cost —.

## WRITTEN

*Find the cost of:*

14. 4270 brick at \$7 per M. ( $4270 = 4.270 \text{ M} = 4.27 \text{ M.}$ )

15. 6480 brick at \$6 per M.

16. 8670 lb. coal at \$4 per ton.

17. 7290 lb. coal at \$5 per ton.

18. 80 sheets at \$2.40 per ream.





4. Find the value of the grass plot at 5¢ per square foot.
5. On the side from  $B$  to  $E$  is a gravel walk 2 ft. wide. Find its area from  $B$  to  $C$ .
6. Find its area from  $N$  to  $O$ .
7. Find its area from  $D$  to  $E$ .
8. Find the cost of constructing the walk at 15¢ per square foot.
9. Find the cost of constructing a fence around the grass plot inside the walk at \$.154 per rod.
10. Find the cost of a fence from  $M$  to  $P$  along the outer edge of the walk at \$1.32 per rod.
11. Make and receipt this bill of goods sold by you to Michael J. Dooley: June 7, 5 yd. calico @ 8¢; 12 yd. gingham @ 10¢; 5 spools silk @ 8¢; June 17, 10 yd. lace @ 20¢; 9 yd. lining @ 7¢.

#### LXXIV. TIME BETWEEN DATES

1. 5 weeks are ——— days.
2. 31 days are ——— weeks and ——— days.
3. From January 1st to January 2d it is ——— day.
4. From January 1st to January 31st it is ——— days.
5. From Jan. 14th to Feb. 2d it is ——— days.
6. From April 2d to May 3d it is ——— days.

7. From June 17th to July 18th it is ——— days.
8. From March 9th to April 12th it is ——— days, or ——— weeks and ——— days.
9. From Feb. 16th to March 5th it is ——— days, when February has 28 days.
10. If Jan. 1st is Monday, the other Mondays in January are the ———th, the ———th, the ———d, and the ———th.
11. In a common year there are ——— weeks and ——— day.
12. In a leap year there are ——— weeks and ——— days.
13. If the 12th of February of a common year is Monday, the 12th of February of the next year is ———.
14. If Washington's birthday of a common year is on Tuesday, the next year it will be on ———.

## WRITTEN

*How many days from :*

- |                          |                          |
|--------------------------|--------------------------|
| 15. July 5 to Sept. 4? * | 22. Jan. 2 to Mar. 2?    |
| 16. June 1 to Oct. 6?    | 23. Feb. 29 to April 8?  |
| 17. Apr. 9 to July 4?    | 24. July 17 to Sept. 3?  |
| 18. March 6 to Aug. 7?   | 25. Aug. 9 to Nov. 15?   |
| 19. July 19 to Dec. 31?  | 26. Sept. 30 to Oct. 29? |
| 20. Aug. 28 to Nov. 18?  | 27. Oct. 31 to Jan. 31?  |
| 21. May 3 to Aug. 2?     | 28. Nov. 18 to Jan. 1?   |

\* Pupils should think thus: July 5 to July 31, 26 days; July 31 to Aug. 31, 31 days; Aug. 31 to Sept. 4, 4 days. 26 da. + 31 da. + 4 da. = 61 da.

## LXXV. PERIMETER AND AREA

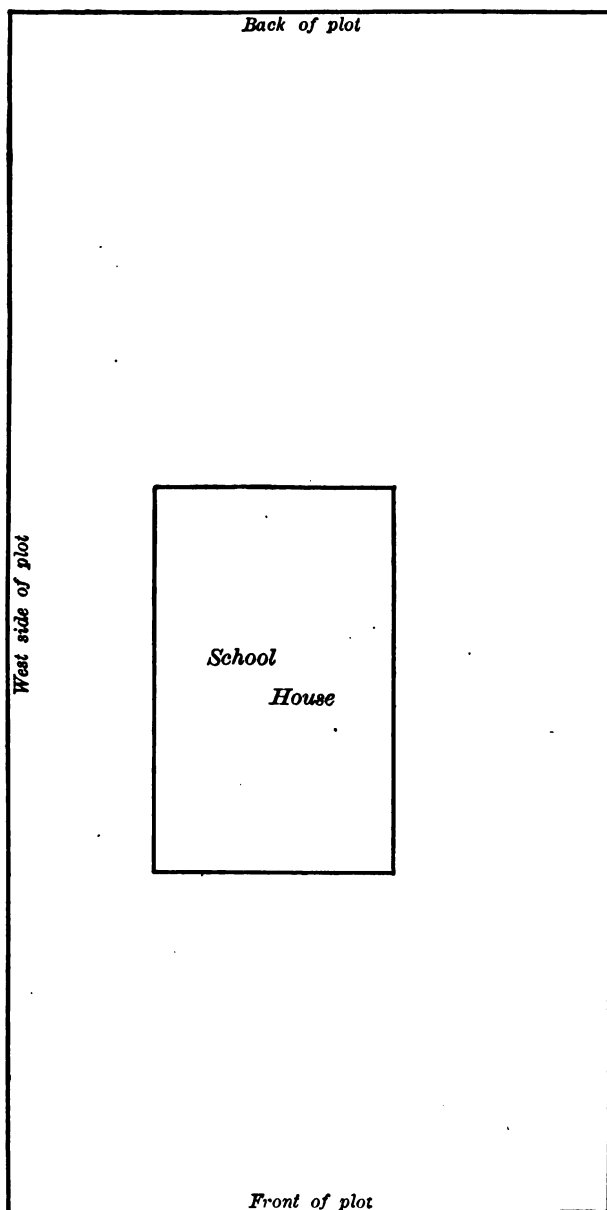
This diagram is drawn on a scale of 24 feet to the inch.

## WRITTEN

1. How many feet long is the plot?
2. How many feet wide?
3. How many feet long is the schoolhouse?
4. How many feet wide?
5. How many feet from the schoolhouse to the front of the plot?
6. How many feet from the schoolhouse to the west side of the plot?
7. How many feet in the perimeter of the plot?
8. What will it cost to inclose the plot with fence costing \$1.21 per rod?
9. How many square feet in the area of the plot?
10. An acre contains 43,560 square feet. What fraction of an acre is the plot?\*
11. This plot is a little — than  $\frac{1}{4}$  of an acre.
12. Find the value of the plot at \$484 per acre.
13. Find the value of the plot at 6¢ a square foot.†

\* Bear in mind that each square foot is  $\frac{1}{43560}$  of an acre. 2 square feet are  $\frac{2}{43560}$  of an acre, and so on.

† There are 11,250 sq. ft. in the plot. If one square foot costs 6¢, 11,250 sq. ft. cost 11,250 times 6¢; or, at 1 cent a square foot the cost would be \$112.50, and at 6¢ a square foot the cost must be 6 times \$112.50. The pupil must not suppose that he multiplies by 6¢.



## LXXVI. REVIEW

## ORAL

1. A bushel of wheat weighs 60 pounds. 120 pounds of wheat are — bushels.
2. 180 lb. of wheat at 80¢ per bushel will cost —.
3. A bushel of oats weighs 32 pounds. 2 bushels of oats weigh — pounds.
4. 96 pounds of oats at 30¢ a bushel will cost —.
5. 128 pounds of oats at 40¢ per bushel will cost —.
6. 1.2 tons are — pounds. 3 tons are — pounds.
7. 2500 lb. of coal at \$5 a ton will cost —.
8. 2 lb. are — ounces. 24 ounces are — pounds.
9. 2 lb. 4 oz. of butter at 20¢ a lb. will cost —.
10. 240 sheets of paper at \$2 per ream will cost —.
11. 2 quires of paper at  $\frac{1}{2}$ ¢ a sheet will cost —.
12. In 5 quires there are — sheets.
13. In 2 reams there are — sheets less than 1000.

## WRITTEN

14. In 1568 lb. of oats there are how many bushels?
15. In 13,620 lb. of wheat there are how many bushels?
16. Find the cost of 1120 lb. of oats at 42¢ per bushel.
17. Find the cost of 1920 lb. of wheat at 70¢ per bushel.
18. Find the cost of 18,400 lb. of coal at \$5 per ton.

19. At 20¢ a pound, how many pounds of butter can be bought for \$13.20?

20. How many pounds in 8.4 tons?

21. Find the cost of 7280 lb. of feed at \$20 per ton.

22. Bought 2 reams of paper at \$1.80 per ream, and sold it at  $\frac{1}{2}$ ¢ per sheet. Find the profit.

23. Bought paper at \$1.40 per ream, and sold it at 14¢ a quire. Find the profit on one ream.

24. Find the cost of 7 cwt. of butter at 22¢ per lb.

## LXXVII. RATIO, PROPORTION, AND PERCENTAGE (a)

### ORAL

1. One tenth of 28 is ——. 28 is  $\frac{1}{10}$  of ——.

2. One ninth of 27 is ——. 27 is  $\frac{1}{9}$  of ——.

3. 3 tenths of 30 are ——. 30 is  $\frac{3}{10}$  of ——.

4. 5 ninths of 45 are ——. 45 is  $\frac{5}{9}$  of ——.

5. 10% of 28 is ——. 28 is 10% of ——.

6.  $11\frac{1}{3}\%$  of 27 is ——. 27 is  $11\frac{1}{3}\%$  of ——.

7. A man having \$28 lost 10% of it. He lost — dollars.

8. 28 sheep were 10% of all the sheep which a farmer had. He had — sheep.

9. 80% of 30 = 30 is 80% of ——.

10. 80% of 40 = 40 is 80% of ——.

11. Mr. Jones bought a cow for \$30, and sold it for 80% as much. He received — dollars.

12. \$30 are 80% of John's money. He has ——— dollars.  
 13. 5 is ——— of 50. 50 is ——— times 5.  
 14. 20 is ——— of 25. 25 is ——— of 20.

## WRITTEN

15. Find  $\frac{3}{10}$  of 840.      18. 315 is  $\frac{5}{9}$  of what?  
 16. 840 is  $\frac{3}{10}$  of what?      19. Find 80% of \$576.  
 17. Find  $\frac{5}{9}$  of 315.      20. \$576 are 80% of what?  
 21.  $11\frac{1}{3}\%$  of 8910 is 10% of what?  
 22. 16 is ——— of 6. . A man can earn ——— as much in 16 days as he can earn in 6 days. If he earns \$9 in 6 days, he can earn how much in 16 days?

## LXXVIII. RATIO, ETC. (6)

## ORAL

1. 33 is ——— of 44. 44 is ——— of 33.  
 2. 27 is ——— of 36. 36 is ——— of 27.  
 3. 15 is ——— of 20. If a horse is fed 28 pecks of oats in 20 days, in 15 days he should be fed ——— pecks.  
 4. If a man earns \$40 in 20 days, in 15 days he can earn ——— dollars.  
 5. 7 is ———% of 35. 6 is ———% of 30.  
 6. 7 is ———% of 42. 8 is ———% of 48.  
 7. 7 is ———% of 49. 8 is ———% of 64.  
 8. 7 is ———% of 28. 8 is ———% of 24.  
 9.  $\frac{1}{4}$  is ———% of  $\frac{1}{2}$ .  $\frac{1}{2}$  is ———% of  $1\frac{1}{2}$ .

10. Mary baked 24 pancakes. Her brother ate 25% of them. He ate ——— cakes.

11. A farmer having 72 bushels of wheat had  $16\frac{2}{3}\%$  of it ground to flour. He had ——— bushels made into flour.

### WRITTEN

12. If 20 qt. of milk cost \$1.20, what will 15 qt. cost?

13. A man having 320 bushels of grain fed  $33\frac{1}{3}\%$  of it to his cattle. He fed ——— bushels.

14. Find  $83\frac{1}{3}\%$  of \$720.

15.  $\frac{3}{4}$  of 144 are  $\frac{3}{5}$  of what?

16. \$28 are what per cent of \$84?

17. 36 is what per cent of 288?\*

18. 84 is what per cent of 105?

19. 17 is what per cent of 34?

### LXXIX. RATIO, ETC. (c)

#### ORAL

1. James had 12¢ in his hand; this was  $16\frac{2}{3}\%$  of all the money he had. He had ——— cents in all.

2. A man had 18 sheep. Some dogs killed three of them. They killed ———% of his sheep.

3. 80% of 60 =  $83\frac{1}{3}\%$  of 60 =

4. 80% of 45 =  $83\frac{1}{3}\%$  of 12 =

\* 36 is  $(\frac{36}{288})\frac{1}{8}$  of 288 = ———% of 288.



5. A real estate agent bought a lot for a purchaser, paying \$800. He charged the purchaser 5% commission.\* What was the total expense of the transaction to the purchaser?

6. 12 is 80% of ——. 20 is  $83\frac{1}{3}\%$  of ——.

7. 24 is 80% of ——. 15 is  $83\frac{1}{3}\%$  of ——.

8. 14 is 7% of ——. 15 is 3% of ——.

9. A real estate agent collected rent for the owner of some houses, for which he charged 3%.† His commission being \$6, he must have collected — dollars.

10. 4 is —% of 5. 44 is —% of 55.

11. 5 is —% of 6. 55 is —% of 66.

12. \$28 are —% of \$700.‡ \$18 are —% of \$600.

#### WRITTEN

13. Find 80% of 140.

14. 140 is 80% of what?

15. Find  $83\frac{1}{3}\%$  of \$720.§

16. \$720 are  $83\frac{1}{3}\%$  of what?

17. \$18 is what per cent of \$300?

18. \$60 is what per cent of \$1200?

19. \$1.50 is what per cent of \$30?

20. An agent collected \$600; after taking out his commission of \$36 he paid the remainder, \$564, to his employer. What was his rate of commission?

\* 5% of \$800.

† 3% of the sum collected.

‡  $\frac{28}{700} = \frac{2}{100}$ , or —%

§ App. No. 11.

**LXXX. RATIO, ETC. (d)**

## ORAL

1. One pint is ——% of a quart.
2. One quart is ——% of a gallon.
3. One quart is ——% of a peck.
4. One pint is ——% of a gallon.
5. One peck is ——% of a bushel.
6. 8 ounces are ——% of a pound.
7. 4 ounces are ——% of a pound.
8. 50 pounds are ——% of a hundredweight.
9. 25 pounds are ——% of a hundredweight.
10. 75 pounds are ——% of a hundredweight.
11. 30 lb. of wheat are ——% of a bushel.
12. 15 lb. of wheat are ——% of a bushel.
13. 40 lb. of wheat are ——% of a bushel.
14. 50 lb. of wheat are ——% of a bushel.
15. 16 lb. of oats are ——% of a bushel.
16. 8 lb. of oats are ——% of a bushel.
17. 24 lb. of oats are ——% of a bushel.
18. 20 lb. of oats are ——% of a bushel.

## WRITTEN

19. 1200 lb. are what per cent of a ton ? \*
20. 2640 ft. are what per cent of a mile ?
21. 1320 ft. are what per cent of a mile ?
22. 2 inches are what per cent of a foot ?
23. One rod is what per cent of 33 feet ?
24.  $7\frac{1}{2}$  lb. of wheat are what per cent of a bushel ?
25. 24 lb. of wheat are what per cent of a bushel ?

## LXXXI. RATIO, ETC. (e)

## ORAL

1. One half of 5.2 is ——. 5.2 is  $\frac{1}{2}$  of ——.
2. One third of 4.2 is ——. 4.2 is  $\frac{1}{3}$  of ——.
3. Two thirds of 2.4 are ——. 2.4 is  $\frac{2}{3}$  of ——.
4. Three fourths of 2.4 are ——. 2.4 is  $\frac{3}{4}$  of ——.
5.  $12\frac{1}{2}\% = .12\frac{1}{2} = \frac{1}{8}$ .  $12\frac{1}{2}\%$  of 32 =
6.  $37\frac{1}{2}\% = .37\frac{1}{2} = \frac{3}{8}$ .  $37\frac{1}{2}\%$  of 32 =
7.  $62\frac{1}{2}\% = .62\frac{1}{2} = \frac{5}{8}$ .  $62\frac{1}{2}\%$  of 32 =
8.  $87\frac{1}{2}\% = .87\frac{1}{2} = \frac{7}{8}$ .  $87\frac{1}{2}\%$  of 32 =
9.  $12\frac{1}{2}\%$  of 72 = ——. 72 is  $12\frac{1}{2}\%$  of ——.
10.  $37\frac{1}{2}\%$  of 72 = ——. 72 is  $37\frac{1}{2}\%$  of ——.

\* 1200 lb. =  $\frac{1200}{2240}$  ton =  $\frac{3}{8}$  ton. The ton is 100% of itself. 1200 lb. being  $\frac{3}{8}$  of a ton must equal  $\frac{3}{8}$  of 100% of a ton, or 60% of a ton. Or, 1% of a ton is 20 lb.  $20 \overline{)1200}$  1200 lb. are 60 times 20 lb.  $\therefore$  1200 lb. are 60% of a ton.

11.  $62\frac{1}{2}\%$  of 40 = ———. 40 is  $62\frac{1}{2}\%$  of ———.
12.  $87\frac{1}{2}\%$  of 56 = ———. 56 is  $87\frac{1}{2}\%$  of ———.
13. 1.2 is ——— of 1.8.\* 1.8 is ——— of 1.2.
14. 1.2 is ——— of 1.6. 1.6 is ——— of 1.2.
15. 2.4 is ——— of 3.6. 3.6 is ——— of 2.4.
16. 2.6 is ——— of 3.9. 3.9 is ——— of 2.6.
17. One half of 2.4 is  $\frac{2}{3}$  of ———.
18. Two thirds of 2.4 is  $\frac{1}{2}$  of ———.
19. If a man can walk 3.6 miles in 1.2 hours, in 1.6 hours he can walk ——— miles.

## WRITTEN

20. If an engineer is paid \$195 for 1.3 months, for 2.6 months he should be paid how much?
21. If a man earns \$36 in 1.2 months, what will he earn in 1.6 months?
22. If 2.4 acres cost \$360, how much will 3.6 acres cost?
23. Find  $87\frac{1}{2}\%$  of \$1256.
24. Find  $62\frac{1}{2}\%$  of \$2560.
25. \$2560 are  $62\frac{1}{2}\%$  of what?
26. 160 is  $87\frac{1}{2}\%$  of what?

 \* 12 tenths are  $(\frac{11}{12})\frac{1}{3}$  of 18 tenths.

**LXXXII. RATIO, ETC. (f)****ORAL**

1. 2.7 is ——— of 3.6. 3.6 is ——— of 2.7.
2. 2.5 is ——— of 3 (3.0). 3 is ——— of 2.5.
3. 2.8 is ——— of 3.5. 3.5 is ——— of 2.8.
4. Two thirds of 2.7 are  $\frac{3}{4}$  of ———.
5. Three fourths of 3.2 are  $\frac{2}{3}$  of ———.
6. 5 is ———% of 40. 6 is ———% of 16.
7. 9 is ———% of 16. 15 is ———% of 40.
8. 35 is ———% of 56. 21 is ———% of 24.
9. 10 is ———% of 16. 14 is ———% of 16.
10. 28 is ———% of 32. 40 is ———% of 64.
11. 1.2 is ———% of 9.6. 3.6 is ———% of 9.6.
12. Mr. Jackson bought a bill of goods amounting to \$40, and was allowed  $12\frac{1}{2}\%$  off for cash. He paid ———.
13. After paying  $62\frac{1}{2}\%$  of a debt, Mr. Johnson still owed \$12. How much was the original debt?
14. A woman having 56 hens, sold  $62\frac{1}{2}\%$  of them. She had ———% of them left. How many hens had she left?

**WRITTEN**

15. 8.4 is what per cent of 9.6?
16. 45 is what per cent of 7.2?
17. Find  $87\frac{1}{2}\%$  of 504.

18. 504 is  $87\frac{1}{2}\%$  of what?
19. Find  $12\frac{1}{2}\%$  of 976.
20. 976 is  $12\frac{1}{2}\%$  of what?
21. Find  $37\frac{1}{2}\%$  of 408.
22. 408 is  $37\frac{1}{2}\%$  of what?
23.  $16\frac{2}{3}\%$  of 60 is 20% of what?
24. A man having 640 bu. of grain sold  $87\frac{1}{2}\%$  of it. How many bushels did he sell?
25. Mr. Janeway had 60 dozen eggs.  $16\frac{2}{3}\%$  of them proved bad. Find the value of the rest at 25¢ per dozen.
26. \$72 are what per cent of \$600? \*

### LXXXIII. RATIO, ETC. (g)

#### ORAL

1.  $12\frac{1}{2}\%$  of 96 =  $25\%$  of 80 =
2.  $37\frac{1}{2}\%$  of 76 =  $50\%$  of 80 =
3.  $62\frac{1}{2}\%$  of 96 =  $75\%$  of 80 =
4.  $87\frac{1}{2}\%$  of 96 =  $87\frac{1}{2}\%$  of 80 =
5. 24 is  $37\frac{1}{2}\%$  of ——. 18 is  $37\frac{1}{2}\%$  of —.
6. 35 is  $62\frac{1}{2}\%$  of ——. 45 is  $62\frac{1}{2}\%$  of —.
7. 35 is  $87\frac{1}{2}\%$  of ——. 42 is  $87\frac{1}{2}\%$  of —.
8. 63 is  $87\frac{1}{2}\%$  of ——. 84 is  $87\frac{1}{2}\%$  of —.

$$* 72 = \frac{72}{600} \text{ of } \$600 = \frac{12}{100} \text{ of } \$600 = \text{---} \% \text{ of } \$600.$$

9. 30 is — % of 80. 30 is — % of 48.
10. 42 is — % of 48. 63 is — % of 72.
11. \$56 are what per cent of \$800? \$56 are — hundredths of \$800. — hundredths are — %.
12. \$64 are what per cent of \$800. \$64 are — hundredths of \$800. — hundredths are — %.
13. \$16 are — % of \$200.
14. \$24 are — % of \$300.
15. \$25 are — % of \$500.
16. \$28 are — % of \$400.
17. \$35 are — % of \$700.
18. \$35 are — % of \$500.

## WRITTEN

19. A real estate agent sold a house for \$6800. As he charged 5% commission, he should retain — dollars for his services.

20. An agent sold some property. His commission at 5% amounted to \$60. For how much did he sell the property? (\$60 are 5% of what?)

- |                        |                          |
|------------------------|--------------------------|
| 21. Find 7% of \$740.* | 24. \$9 are 5% of what?† |
| 22. Find 8% of \$94.   | 25. \$12 are 6% of what? |
| 23. Find 9% of \$982.  | 26. \$13 are 2% of what? |

\* 1% or 1 hundredth of \$740 = \$7.40.

†  $\frac{1}{5}$  of \$9 is 1% of what?

## LXXXIV. RATIO, ETC. (h)

## ORAL

1.  $\frac{1}{3}$  of .24 is ——. .24 is  $\frac{1}{3}$  of —.
2.  $\frac{1}{6}$  of .42 is ——. .42 is  $\frac{1}{6}$  of —.
3.  $\frac{1}{5}$  of .35 is ——. .25 is  $\frac{1}{5}$  of —.
4.  $\frac{2}{3}$  of .42 are ——. .42 is  $\frac{2}{3}$  of —.
5.  $20\% = .20 = \frac{2}{10}$ .  $20\%$  of 45 =
6.  $30\% = .30 = \frac{3}{10}$ .  $30\%$  of 70 =
7.  $40\% = .40 = \frac{4}{10}$ .  $40\%$  of 40 =
8.  $40\%$  of 70 = .  $40\%$  of 80 =
9. 24 is — of 32. 32 is — of 24.
10. .40 is — .64. .24 is — of .40.
11. .16 is — 40. .40 is — of .16.
12. 12 is — % of 40. 7 is — % of 14.
13. Two thirds of .36 are 1 fourth of —.
14. One half of .36 is 3 fourths of —.

## WRITTEN

15. If .16 of a ton of hay cost \$4, what will .40 of a ton cost?

16. If .24 of a ton of hay cost \$12, what will .32 of a ton cost?



17.  $\frac{2}{3}$  of \$16.32\* are  $\frac{1}{4}$  of what?  
 18.  $\frac{3}{4}$  of \$27.84 are  $\frac{2}{3}$  of what?  
 19. Find  $\frac{1}{3}$  of 8.37.                      22.  $\frac{3}{5}$  of \$3.75 =  
 20. Find  $\frac{5}{6}$  of 8.34.                      23. \$3.75 are  $\frac{3}{5}$  of what?  
 21. \$18.20 are  $\frac{5}{6}$  of what?    24. Find 40% of \$6.95.  
 25. An agent sold a property for \$3600, for which service he was paid \$144. Find his rate of commission.†

## LXXXV. RATIO, ETC. (I)

## ORAL

1. .45 is ——— of .72. .72 is ——— of .45.  
 2. .30 is ——— of .48. .48 is ——— of .30.  
 3. 42 is ———% of 48. 84 is ———% of 96.  
 4. 2 is ———% of 16. 1 sq. ft. is ———% of a square yard.  
 5. 2 is ———% of 3.  $3\frac{1}{2}$  is ———% of 7.  
 6. On a certain lawn were 12 trees. 3 trees died. ———% of the trees died. ———% were left.  
 7. Of 20 shrubs on a lawn 2 were winter killed. ———% of the shrubs were killed. ———% lived.

\* 3)  $\frac{\$16.32}{\$5.44}$   $\frac{1}{3}$  of \$16 is \$5, \$1 remainder. \$1 = 10 tenths of a dollar, 10 tenths + 3 tenths = 13 tenths.  $\frac{1}{4}$  of 13 tenths = 4 tenths, 1 tenth remainder. 1 tenth of a dollar = 10 hundredths of a dollar. 10 hundredths + 2 hundredths = 12 hundredths.  $\frac{1}{4}$  of 12 hundredths = 4 hundredths.

† 1% of \$3600 = \$36.  $\$144 \div \$36 = 4$ . Therefore the rate is 4 times 1% = 4%.

8. Of 24 varieties of flowers in a garden 25% had blossomed. — varieties had not blossomed.

9.  $40\%$  of 32 =  $30\%$  of 16 = ( $\frac{1}{10}$  of 16 = 1.6.)

10. 4.3 is  $10\%$  of —. 2.9 is  $10\%$  of —.

11. 6.3 is  $90\%$  of —. 4.2 is  $70\%$  of —.

12. 2.7 is —% of 27. 4.75 is —% of 475.

13. 6.8 is —% of 68. 94 is —% of 940.

14. 4.72 is —% of 47.2. 3.96 is —% of 396.

#### WRITTEN

15. 3.63 is what part of 14.52.\*

16. 840 is what per cent of 6720?

17. 9.2 is what per cent of 73.6?

18. Find  $70\%$  of 842.

19. 840 is  $70\%$  of what?

20. 720 is  $90\%$  of what?

21. An agent collected \$420. Find his commission at  $5\%$ .

22. An agent collected \$670. He received \$26.80 for his services. Find his rate of commission.

23. An agent who charges  $4\%$  for collecting received for his services \$29.20. How much did he collect?

\* 1 hundredth is  $\frac{1}{100}$  of 1452 hundredths. 2 hundredths are  $\frac{2}{100}$  of 1452 hundredths. 363 hundredths are  $\frac{363}{100}$  of 1452 hundredths.  $\frac{363}{100} = \frac{3}{10}$ .

## LXXXVI. RATIO, ETC. (J)

## ORAL

1. One half of 1 (1.0) is ——.  $\frac{1}{2}$  of 3 = ( $\frac{1}{2}$  of 30 tenths).
2. One fourth of 6 (6.0) is ——.  $\frac{1}{4}$  of 4 =
3. One sixth of 9 is ——.  $\frac{1}{6}$  of 15 = ( $\frac{1}{6}$  of 150 tenths).
4. One eighth of 4 is ——.  $\frac{1}{8}$  of 12 =
5. 1 is ——— of 15. 2 is ——— of 15.
6. 3 is ——— of 15, or ———. 4 is ——— of 15.
7. 5 is ——— of 15, or ———. 6 is ——— of 15,  
or ———.
8. 7 is ——— of 15. 8 is ——— of 15.
9. 1% of \$245 = 1% of \$363 =
10. 1% of \$320 = 2% of \$320 =
11. 10% of \$12.1 = 2% of \$12.1 =
12. 10% of \$10.20 = 3% of \$10.20 =
13. 14 is 2% of ———. 21 is 3% of ———. (3 hundredths.)
14. 45 is 5% of ———. 28 is 4% of ———.
15. 72 is 6% of ———. 48 is 8% of ———.

## WRITTEN

- |                                 |                               |
|---------------------------------|-------------------------------|
| 16. Find $\frac{1}{2}$ of 655.* | 18. Find $\frac{1}{4}$ of 87. |
| 17. Find $\frac{1}{4}$ of 742.  | 19. 36 is what part of 96?    |

\*  $2 \overline{)655.0}$   
 $327.5, \frac{1}{2}$  of 6550 tenths.

20. 144 is what part of 288 ?    23. Find 7% of 860 trees.  
 21. Find 3% of \$846.\*    24. 85.4 is 7% of what ?  
 22. Find 4% of 960 bu.    25. 87.3 is 9% of what ?  
 26. A farmer owning 80 cows sold  $7\frac{1}{2}\%$  of them. How many did he have left ?  
 27. An agent sold a farm for \$6000. He charged a commission of  $2\frac{1}{2}\%$ . Find his commission, and how much he paid over to the owner.

### LXXXVII. RATIO, ETC. (k)

#### ORAL

1. 1.5 is ——— of 2.7.    2.7 is ——— of 1.5.
2. .15 is ——— of .27.    .27 is ——— of .15.
3. .13 is ——— of .25.    .25 is ——— of .13.
4. \$6 is ——— % of \$100.    \$12 is ——— % of \$200.
5. \$8 is ——— % of \$200.    \$9 is ——— % of \$200.
6. \$10 is ——— % of \$200.    \$11 is ——— % of \$200.
7. 3% of \$230 =    \$15 is 3% of ———.
8. \$15 is ——— % of \$500.    5% of 400 =
9. A lawyer collected \$700. He retained \$49 as his commission. The remaining ——— dollars he turned over to his employer. His rate of commission was ——— %.

\* First consider 1 % of \$846, which is \$8.46; then 3 times \$8.46.    \$846

.03
\$25.38

## WRITTEN

10. \$28 is what per cent of \$200?\*
11. \$29 is what per cent of \$200?
12. \$69 is what per cent of \$300?
13. \$71 is what per cent of \$300?
14. \$87 is what per cent of \$1200?
15. \$66 is what per cent of \$800?
16. 28 is 5% of what?†
17. 17 is 4% of what?
18. 19 is 4% of what?
19. 27 is 5% of what?
20. 27 is 6% of what?
21. 34 is 8% of what?

**LXXXVIII. RATIOS OF LINEAR AND SURFACE  
MEASURES EXPRESSED IN PER CENT**

## ORAL

1. One inch is ——— of a foot.
2. One inch is ———% of a foot. ( $\frac{1}{12}$  of 100%.)
3. Two inches are ———% of a foot.
4. Three inches are ———% of a foot.
5. Four inches are ———% of a foot.
6. Five inches are ———% of a foot.

\* 1% of \$200 = \$2. \$28 = 14 times \$2, therefore \$28 is 14 times 1%, or 14%. Or, \$28 =  $(\frac{28}{200}) \frac{1}{100}$  of \$200 = 14% of \$200.

† Since 5 per cent of the required number is 28, 1% is 5.6, and 100% (one hundred hundredths) is 100 times 5.6, or 560. Or,  $5\% = \frac{5}{100} = \frac{1}{20}$ ;  $\frac{1}{20}$  of the required number is \$28,  $\frac{20}{1}$  of the required number must be 20 times \$28, or \$560.

7. Six inches are ——% of a foot.
8. Seven inches are ——% of a foot.
9. Eight inches are ——% of a foot.
10. Nine inches are ——% of a foot.
11. Ten inches are ——% of a foot.
12. Eleven inches are ——% of a foot.
13. One foot and 6 inches are ——% of a yard.
14. One yard is —— ——— of 20 inches, or —— and —— times 20 inches.
15. 20 square rods are —— ——— of an acre.
16. 20 square rods are ——% of an acre.
17. If an acre is worth \$320, 20 square rods are worth —— dollars.

## WRITTEN

18. One square rod is what per cent of one acre?
19. One yard is what per cent of a rod?
20. One square foot is what per cent of a square yard?
21. If an acre of land cost \$420, what will 20 square rods cost?
22. If 20 square rods of land cost \$130, what will 36 square rods cost?
23. When 1 ft. 6 in. of wire cost 43 cents, what will 2 yards cost?
24. 5 sixteenths is what per cent of  $\frac{3}{8}$ ? (3 eighths = —— sixteenths.)

## LXXXIX. APPLICATIONS

## ORAL

1. A man with a salary of \$1200 spent  $33\frac{1}{3}\%$  of it for rent and clothing. He had — dollars left.

2. A man's expenses were \$60 on a certain journey. That sum was 20 % of all the money he had with him. He had — dollars with him.

3. A man having \$60 spent \$15. He spent — % of his money.

4. 30 % of 15 is  $33\frac{1}{3}\%$  of —.

5. Two thirds of 18 are  $\frac{3}{4}$  of —.

## WRITTEN

6. A man with a salary of \$1640 spent 16 % of it for rent. How much was his rent?

7. A bed and bureau cost \$96.  $41\frac{2}{3}\%$  of this sum was paid for the bed. How much money was paid for each? (See App.)

8. A man raised 60 bushels of wheat. As only 6 % of his whole crop was wheat, how many bushels of grain did he raise?

9. A boy earned \$3.60. He spent \$2.40. What per cent of his earnings did he spend?

10.  $\frac{2}{3}$  of 825 are  $\frac{3}{4}$  of what?

11. 20 % of 130 is  $33\frac{1}{3}\%$  of what?

12. A woman paid \$27 for a dress. This sum was  $66\frac{2}{3}\%$  of all the money she had. How much had she?

13. A farmer having 6850 bu. of oats sold 2% of them. How many bushels had he left?

14. A farmer having 960 bushels of barley sold 360 bushels. What per cent of his barley did he sell?

15. \$29.05 are what per cent of \$340?\*

# **XC. RATIOS OF TIME MEASURES AND DRY MEASURES EXPRESSED IN PER CENT**

## ORAL

1. 15 minutes are — % of an hour.
2. 10 seconds are — % of a minute.
3. 36 minutes are — % of an hour.
4. 40 minutes are — % of an hour.
5. 18 hours are — % of a day.
6. 14 hours are — % of a day.
7. 20 hours are — % of a day.
8. 1 quart is — % of a gallon.
9. 1 quart is — % of a peck.
10. 2 quarts are — % of a peck.
11. 3 quarts are — % of a peck.
12. 4 quarts are — % of a peck.
13. 5 quarts are — % of a peck.
14. 6 quarts are — % of a peck.

81

\* One % of \$340 = —.  $\$3.40 \overline{) \$28.05}$  Therefore \$28.05 is — % of \$340.



15. 7 quarts are — % of a peck.
16. 2 thirds of an hour are 1 half of — minutes.
17. 3 fourths of a minute are  $\frac{1}{3}$  of — seconds.
18. One half of a day is  $\frac{2}{3}$  of — hours.

## WRITTEN

19.  $7\frac{1}{2}$  minutes are what per cent of an hour?
20. 28 seconds are what per cent of a minute?
21. 48 minutes are what per cent of an hour?
22. If 200 gallons of water flow through a pipe in 48 minutes, how many gallons will flow through in an hour?
23. 18 hr. are what per cent of 2 days?
24. 6 qt. are what per cent of 2 pecks?
25. 1 qt. is what per cent of 2 gallons?
26.  $12\frac{1}{2}$  % of a day is 50 % of how many hours?
27. One fifth of a day is 25 % of how many hours?
28. One eighth of an hour is  $16\frac{2}{3}$  % of how many minutes?

## XCI. TO FIND THE BASE (a)

## ORAL

1. 50 % more than 40 means, 50 % of 40 plus 40.
2. 50 % more than 40 = —. 50 % more than 20 = —.

3. In the first example 40 is the *base*. In the second example 20 is the *base*.\*

\* In all examples on this page it will be seen that the base follows *than*.

4. 50 % less than 40 means, 40 less 50 % of 40.
5. 50 % less than 40 = 50 % less than 50 =
6. 25 % more than 36 = 25 % less than 36 =
7. 12 is 50 % more than what number? Assuming  $x$  to stand for the required number (the base), we may think 50 % of  $x = \frac{1}{2}x$ .  $x$  and  $\frac{1}{2}x = \frac{3}{2}x$ . Since  $\frac{3}{2}x = 12$ ,  $\frac{1}{2}x = 4$ , and  $x = 8$ . 12 is 50 % more than 8.
8. 12 is 50 % less than what number?  $12 = x$  less  $\frac{1}{2}x = \frac{1}{2}x$ .  $x = 24$ .
9. 12 is  $33\frac{1}{3}$  % more than —. \* 12 is 25 % less than —.
10. 25 is 25 % more than —. 18 is 25 % less than —.
11. 12 is — % more than 8. † 12 is — % less than 16.
12. 16 is — % more than 12. 18 is — % less than 24.

## WRITTEN

13. Find 50 % more than 170.
14. Find 50 % less than 330.
15. Find 25 % more than 85.
16. 195 is 50 % more than what?

$$*x + \frac{1}{3}x = 12$$

$$\frac{4}{3}x = 12$$

$$\frac{1}{3}x = 3$$

$$x = 9$$

The whole of  $x$  plus  $\frac{1}{3}$  of  $x = 1\frac{1}{3}$  times  $x$ , or  $\frac{4}{3}x$ .

If  $\frac{4}{3}x = 12$ ,  $\frac{1}{3}x = \frac{1}{4}$  of 12, or 3.

If  $\frac{1}{3}x = 3$ ,  $\frac{3}{3}x$  or the whole of  $x = 3$  times 3, or 9.

† 12 is 4 more than 8, or  $\frac{1}{2}$  of 8 more than 8,  $\frac{1}{2} = \frac{1}{2} = 50\%$ .

17.  $96\frac{1}{2}$  is 50 % less than what?
18. 108 is  $33\frac{1}{3}$  % more than what?
19. 640 is  $33\frac{1}{3}$  % less than what?
20. Find  $33\frac{1}{3}$  % less than 160.
21. Find 20 % more than 175.
22. Find  $16\frac{2}{3}$  % less than 192.
23. Find  $12\frac{1}{2}$  % more than 96.
24. 165 is how many per cent more than 110?
25. 795 is how many per cent less than 1060?

## XCII. RATIOS OF LENGTHS AS PER CENT

### ORAL

$a$  \_\_\_\_\_

$b$  \_\_\_\_\_

$c$  \_\_\_\_\_

$d$  \_\_\_\_\_

1.  $a$  is equal to \_\_\_\_\_ % of  $b$ .
2.  $a$  is equal to \_\_\_\_\_ % of  $c$ .
3.  $a$  is equal to \_\_\_\_\_ % of  $d$ .
4.  $b$  is equal to \_\_\_\_\_ of  $c$ .  $b$  is equal to \_\_\_\_\_ % of  $c$ .
5.  $b$  is equal to \_\_\_\_\_ of  $d$ .  $b$  is equal to \_\_\_\_\_ % of  $d$ .
6.  $c$  is equal to \_\_\_\_\_ of  $d$ .  $c$  is equal to \_\_\_\_\_ % of  $d$ .
7.  $d$  is equal to \_\_\_\_\_ and \_\_\_\_\_ times  $c$ .

8.  $d$  is equal to — % more than  $c$ .
9.  $d$  is — % longer than  $c$ . (Same as the 8th, but in other words.)
10.  $c$  is — % longer than  $b$ .
11.  $b$  is — times as long as  $a$ .  $b$  is 100% longer than  $a$ .
12.  $d$  is — times as long as  $b$ .  $d$  is — % longer than  $b$ .
13.  $b$  is equal to the whole of  $c$  less what part of  $c$ ?
14. One third of  $c$  equals — % of  $c$ .  $b$  is — % shorter than  $c$ .
15.  $c$  is equal to  $d$  less what part of  $d$ ?
16. One fourth of  $d$  equals — % of  $d$ .  $c$  is — % shorter than  $d$ .
17. Two inches equal — % (hundredths) of one inch.
18. 2 inches are — inch longer than 1 inch. 2 inches are — % longer than 1 inch.
19. 3 inches are — inch longer than 2 inches. 1 inch is — % of 2 inches. 3 inches are — % longer than 2 inches.
20. 2 inches are — inch shorter than 3 inches. 1 inch is — % of 3 inches. 2 inches are — % shorter than 3 inches.
21. 4 inches are — % more than 2 inches.
22. 2 inches are — % less than 4 inches.

XCIII. TO FIND THE BASE (*b*)

## ORAL

1. Frank picked 24 qt. of berries, but Jane picked 25% more. Jane picked — quarts.

2. Daniel had 36¢ with him, while Julia had  $33\frac{1}{3}\%$  less with her. Julia had — cents.

3. My rent is \$28 a month, and my neighbor's rent is \$35 a month. His rent is —% more than mine. My rent is —% less than his.\*

4. \$30 are 50% more than — dollars. Let us suppose  $x$  to stand for the number of dollars required.  
 $x + \frac{1}{2}x = 30$ .  $\frac{3}{2}x = 30$ .  $\frac{1}{2}x = 10$ .  $x = 20$ . \$30 are 50% more than 20 dollars.

5. \$36 are 25% less than — dollars.  $x - \frac{1}{4}x = 36$ .  
 $\frac{3}{4}x = 36$ .  $\frac{1}{4}x = 12$ .  $x = 48$ . \$36 are 25% less than 48 dollars.

6. 40 is 25% more than —. 24 is 25% less than —.

7. 35 is 25% more than —. 18 is 25% less than —.

8. 40 is  $33\frac{1}{3}\%$  more than —. 40 is  $33\frac{1}{3}\%$  less than —.

9. 16 is —% more than 12. 10 is —% less than 15.

10. 15 is —% more than 12. 9 is —% less than 12.

11. 21 is —% more than 18. 16 is —% less than 20.

12. 10 is —% more than 8. 10 is —% less than 12.

13. 5 is —% more than 4. 4 is —% less than 5.

\* The number meant after "than" is the base.

## WRITTEN

14. Farmer Scott has 18 cows. His neighbor has  $11\frac{1}{9}\%$  more. How many has his neighbor?

15. A merchant gained \$2460 in one year. The next year his profit was  $12\frac{1}{2}\%$  less. Find the second year's profit.

16. A clerk's salary was \$960. His assistant's salary was \$840. The clerk earned how much per cent more than his assistant? The assistant earned how much per cent less than the clerk?

## XCIV. TO FIND THE BASE (c)

## ORAL

1. 10 cwt. are ——— of a ton. 5 cwt. are ———.
2. 2 cwt. are ——— of a ton. 1 cwt. is ———.
3. 15 cwt. are ——— of a ton. 16 cwt. are ———.
4. 1 ton is ——— of 15 cwt., or ——— and ——— times 15 cwt.
5. 1 ton is ——— of 16 cwt., or ——— and ——— times 16 cwt.
6. 10 cwt. are ———% of a ton. 5 cwt. are ———% of a ton.
7. 2 cwt. are ———% of a ton. 1 cwt. is ———% of a ton.
8. 42 is 40% more than ———. Let  $x$  stand for the required number, — the base.  $x$  plus  $\frac{2}{5}x = 42$ .  $\frac{7}{5}x = 42$ .  $\frac{1}{5}x = 6$ .  $x = 30$ . 42 is 40% more than ———.

9. 21 is 40% less than ——.  $x - \frac{2}{5}x = 21$ .  $\frac{3}{5}x = 21$ .  
 $\frac{1}{5}x = 7$ .  $x = 35$ . 21 is 40% less than ——.

10. 35 is 40% more than ——.

11. 56 is 40% more than ——.

12. 24 is 40% less than ——.

13. 30 is 40% less than ——.

14. 30 is —-% more than 25. 30 is 5 more than 25,  
 or  $\frac{5}{25}$  of 25 more than 25.  $\frac{5}{25} = \frac{1}{5} = \text{—-%}$ .

15. 45 is —-% less than 54. 45 is 9 less than 54, or  
 $\frac{9}{54}$  of 54 less than 54.  $\frac{9}{54} = \frac{1}{6} = \text{—-%}$ .

16. 21 is —-% less than 28. 32 is —-% more  
 than 24.

#### WRITTEN

17. At \$7 a ton, what will 16 cwt. of coal cost?

18. At \$19 a ton, what will 2 cwt. of hay cost?

19. If 70 lb. of meat cost \$4.90, what will 1 cwt. cost?

20. 40% more than a ton is how many pounds?

21. \$350 are 40% more than what?\*

22. \$276 are 40% less than what?

23. \$2814 are what per cent more than \$2412?

\* Let  $x$  stand for the required number of dollars.

$$x + \frac{2}{5}x = 350$$

$$\frac{7}{5}x = 350$$

$$\frac{1}{5}x = 50$$

$$x = 250$$

∴ \$350 are 40% more than \$250.

## XCV. RATIOS EXPRESSED IN PER CENT

## ORAL

1. Eleven inches are ——— of a foot less than a foot.
2. Eleven inches are ———% less than a foot.
3. One foot is ——— of a yard less than a yard.
4. One foot is ———% less than a yard.
5. Two feet are ——— of a yard less than a yard.
6. Two feet are ———% less than a yard.
7. Five yards are ——— of a rod less than a rod.
8. Five yards are ———% less than a rod.
9. Eight square feet are ——— of a square yard less than a square yard.
10. Eight square feet are ———% less than a square yard.
11. Ten square feet are ——— of a square yard more than a square yard.
12. Ten square feet are ———% more than a square yard.
13. 176 square rods are ——— of an acre more than an acre.
14. 176 square rods are ———% more than an acre.
15. 200 sq. rd. are ——— of an acre more than an acre.
16. 200 sq. rd. are ———% more than an acre.
17. An acre is worth \$120. 176 sq. rd. are ———% more than an acre. 176 sq. rd. are worth ———% more than \$120, or ——— dollars.



## WRITTEN

18. 600 is what per cent more than 480?
19. 600 is what per cent less than 800?
20. 720 sq. rd. are what per cent more than 600 sq. rd.?
21. 720 sq. rd. are what per cent less than 864 sq. rd.?
22. 192 sq. rd. are what per cent more than an acre?
23. 128 sq. rd. are what per cent less than an acre?
24. Mr. Layton's salary is \$1280 a year, and Mr. Lansing's is \$960. (a) Mr. Layton's salary is what per cent more than Mr. Lansing's? (b) Mr. Lansing's salary is what per cent less than Mr. Layton's? (Note a different base in each question.)

## XCVI. APPLICATIONS

## ORAL

1. By selling a wagon for \$80, the owner gained  $33\frac{1}{3}\%$  of the cost. The cost of the wagon was ——.  $x + \frac{1}{3}$  of  $x = 80$ .  $\frac{4}{3}x = 80$ .  $\frac{1}{3}x = 20$ .  $x = \text{---}$ . The wagon cost ——.
2. By selling a wagon for \$75, the owner gained 25%. The cost of the wagon was ——.
3. By selling a wagon for \$60, the owner lost 20%. The cost of the wagon was ——. Let  $x$  stand for the cost.  $x - \frac{1}{5}$  of  $x = 60$ .  $\frac{4}{5}x = 60$ .  $\frac{1}{5}x = 15$ .  $x = \text{---}$ . The wagon cost ——.
4. A man sold a sleigh for \$70, which was  $16\frac{2}{3}\%$  more than he gave for it. He gave — dollars for it.

5. A man sold a sleigh for \$75, which was  $16\frac{2}{3}\%$  less than he gave for it. He gave — dollars for it.

6. By selling a horse for \$120, a man gained 50%. The horse cost him — dollars.

## WRITTEN

7. A house was sold for \$5160, this price being 25% more than the house cost. Find the cost.

8. A house was sold for \$8127, at a loss of 25%. What did the house cost?

9. A mile is what per cent more than 300 rods?

10. 300 rods are what per cent less than a mile?

11. A farm was sold for \$246, at a gain of 20%. Find the cost. (See App.)

## XCVII. REVIEW

## ORAL

1. Joseph has \$60 and John has \$72. Joseph's money equals —% of John's money.

2. John's money is —% more than Joseph's money.

3. Joseph's money is —% less than John's money.

4. John's money equals —% of Joseph's money.

## WRITTEN

5. A mile is what per cent of 280 rods?

6. 280 rods are what per cent of a mile?

7. 280 rods are what per cent less than a mile?

8. A mile is what per cent more than 280 rods?

## ORAL

9.  $33\frac{1}{3}\%$  of 15 is ——. 15 is  $33\frac{1}{3}\%$  of ——. 8 is —-% of 32.

10. 25% of 36 is ——. 36 is 25% of ——. 9 is —-% of 36.

11. 20% of 15 is ——. 15 is 20% of ——. 15 is —-% of 30.

## WRITTEN

12. Find 25% of  $697\frac{1}{2}$ .

13.  $697\frac{1}{2}$  is 25% of what?

14. 28 is what per cent of 70?

15. Find 20% of  $281\frac{1}{2}$ .

16.  $281\frac{1}{2}$  is 20% of what?

17.  $7\frac{1}{2}$  is what per cent of  $22\frac{1}{2}$ ?

18. Find  $16\frac{2}{3}\%$  of  $168\frac{1}{2}$ .

19.  $168\frac{1}{2}$  is  $16\frac{2}{3}\%$  of what?

20.  $3\frac{1}{3}$  is what per cent of  $16\frac{2}{3}$ ?

21. Find  $16\frac{2}{3}\%$  of  $144\frac{1}{3}$ .

22.  $144\frac{1}{3}$  is  $16\frac{2}{3}\%$  of what?

## ORAL

23. 40% of 20 is —.

28. 80% of 60 is —.

24. 20 is 40% of —.

29. 60 is 80% of —.

25. 18 is —-% of 45.

30. 60 is —-% of 75.

26. 60% of 30 is —.

31.  $66\frac{2}{3}\%$  of 24 is —.

27. 27 is —-% of 45.

32. 24 is —-% of 36.

WRITTEN

33. Find 40% of 320.
34. 320 is 40 % of what?
35. 320 is — % of 960.
36. Find 60% of 690.
37. 690 is 60% of what?
38. 690 is what per cent of 1725?
39. Find 80% of 360.
40. 360 is 80% of what?
41. 128 is what % of 160?
42. Find  $66\frac{2}{3}\%$  of 96.
43. 96 is  $66\frac{2}{3}\%$  of what?
44. 96 is what per cent of 144?

XCVIII. REVIEW (a).

ORAL

1.  $12\frac{1}{2}\%$  of 36 is —. 36 is  $12\frac{1}{2}\%$  of —. 36 is — % of 96.
2.  $37\frac{1}{2}\%$  of 24 is —. 24 is  $37\frac{1}{2}\%$  of —. 24 is — % of 192.
3.  $62\frac{1}{2}\%$  of 40 is —. 40 is  $62\frac{1}{2}\%$  of —. 40 is — % of 64.
4.  $87\frac{1}{2}\%$  of 56 is —. 56 is  $87\frac{1}{2}\%$  of —. 14 is — % of 16.
5. One % of 24 is —. 24 is 1% of —. 3 is — % of 300.

6. 2% of 16 is ——. 16 is 2% of ——. 8 is —-% of 200.

7. 3% of 12 is ——. 12 is 3% of ——. 6 is —-% of 200.

8.  $1\frac{1}{2}\%$  of 12 is ——. 12 is  $1\frac{1}{2}\%$  of ——. 3 is —-% of 200.

9.  $2\frac{1}{2}\%$  of 10 is ——. 10 is  $2\frac{1}{2}\%$  of ——. 5 is —-% of 200.

10. 50% more than 90 is ——. 90 is 50% more than —.

11. 25% more than 40 is ——. 40 is 25% more than —.

12. 50% less than 90 is ——. 90 is 50% less than —.

## WRITTEN

13. Raymond walked 26 miles one day, while Julia walked  $12\frac{1}{2}\%$  as far. How far did Julia walk?

14. A farmer having \$716 gave his son  $37\frac{1}{2}\%$  of this sum. How much money did he give his son?

15. An orchard of 2400 trees had  $62\frac{1}{2}\%$  of the trees blown down in a storm. How many trees were destroyed?

16. A farmer pointing to his 72 sheep said, "That flock is only  $37\frac{1}{2}\%$  as large as my flock last year." How large was the former flock?

17. A lawyer received \$65 as pay for collecting some money. As his rate of commission was 5%, how much did he collect, and how much did he pay over to his employer?

18. A man sold two houses for \$6000 each. On one he gained 25%, and on the other he lost 25%. (a) What did each cost? (b) Did the man gain or lose on the houses, and how much?

19. A ton is  $11\frac{1}{8}\%$  more than how many pounds?

### XCIX. SIMPLE NUMBERS. ODD, EVEN, PRIME, AND COMPOSITE NUMBERS

#### ORAL

1. The prime factors of 30 are —, —, and —.
2. The composite factors of 30 are —, —, and —.
3. All whole numbers are either prime or composite.
4. All even numbers are composite except —.
5. Some odd numbers are prime and some are composite.
6. Three odd prime numbers are —, —, and —.
7. Three odd composite numbers are —, —, and —.

$$8. \quad 18 = 2 \times 3 \times 3. \quad 6 = 2 \times 3. \quad 18 \div 6 = (2 \times 3 \times 3) \div (2 \times 3). \quad 18 \div 6 = 3.$$

$$9. \quad \frac{18}{9} = \frac{2 \times 3 \times 3}{3 \times 3} = 2. \quad \frac{30}{15} = \frac{2 \times 3 \times 5}{3 \times 5} = 2.$$

$$10. \quad 18 \text{ divided by } 9 = (2 \times 3 \times 3) \div (3 \times 3) = 2.$$

$$11. \quad 36 = 2 \times 2 \times 3 \times 3. \quad 12 = 2 \times 2 \times 3. \quad 36 \div 12 = (2 \times 2 \times 3 \times 3) \div (2 \times 2 \times 3) =$$

12.  $24 = 2 \times 2 \times 2 \times 3$ .      $8 = 2 \times 2 \times 2$ .     8 in 24 ——— times.

13.  $28 = 2 \times 2 \times 7$ .      $14 = 2 \times 7$ .     14 in 28 ——— times.  
(Answer by inspecting the factors.)

14.  $210 = 2 \times 3 \times 5 \times 7$ .

15.  $30(2 \times 3 \times 5)$  is contained in 210 ——— times.

16.  $42(2 \times 3 \times 7)$  is contained in 210 ——— times.

17.  $70(2 \times 5 \times 7)$  is contained in 210 ——— times.

18.  $6(2 \times 3)$  is contained in 210 ——— times.

19.  $105(3 \times 5 \times 7)$  is contained in 210 ——— times.

20.  $35(5 \times 7)$  is contained in 210 ——— times.

#### WRITTEN

21. Find the prime factors of (a) 360; (b) 264; (c) 385.

22. Find the sum of the prime numbers from 37 to 97 inclusive.

23. Find the prime factors of the next three composite numbers above 97.

24. Find the sum of the odd prime numbers from 1 to 31 inclusive.

25. Find the sum of the odd composite numbers from 1 to 27 inclusive.

26. Find the sum of all composite numbers from 50 to 60 inclusive.

## C. MULTIPLES

## ORAL

1. 30 is a multiple of 10. The prime factors of 30 are —, —, and —. The prime factors of 10 are — and —. Among the prime factors of 30 are found both prime factors of 10.

2.  $42 = 2 \times 3 \times 7$ .  $14 = 2 \times 7$ . 42 is a multiple of 14. The prime factors of 14 are among the prime factors of 42. The prime factors of a multiple of a number always include the prime factors of the number itself.

3. The prime factors of 462 are 2, 3, 7, and 11.

4. Is 462 exactly divisible by 2? by 7? by 5? by 13? (Answer by inspecting the factors.)

5.  $3003 = 3 \times 7 \times 11 \times 13$ .

6. Is 3003 exactly divisible by 3? by 13? by 5? by 21? by 77?

7. Is 3003 exactly divisible by 33? by 91? by 143? by 19?

A common multiple of 18, 24, and 30 must contain their prime factors—three 2's, two 3's, and one 5. To be the *least* common multiple it must contain no other factors. The least common multiple of 18, 24, and 30 is  $2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360$ .

A common multiple of 20, 28, and 33 must contain their prime factors: — 2's, — 3, and — 11. The l. c. m. of 20, 28, and 33 is —.

8.  $18 = 2 \times 3 \times 3$ .

$24 = 2 \times 2 \times 2 \times 3$ .

$30 = 2 \times 3 \times 5$ .

9.  $20 = 2 \times 2 \times 5$ .

$28 = 2 \times 2 \times 7$ .

$33 = 3 \times 11$ .



## WRITTEN

10. Find the l. c. m. of 28, 36, and 40.
11. Find the l. c. m. of 40, 50, and 60.
12. Find the l. c. m. of 45, 55, and 60.
13. Find the l. c. m. of 18, 27, and 46.
14. Find the l. c. m. of 24, 35, and 45.
15. 24 is contained in 2520 how many times? Compare factors.
16. 35 is contained in 2520 how many times?

## CI. LEAST COMMON MULTIPLE. MISCELLANEOUS

## ORAL

1.  $2 \times 5 \times 7 = 70$ . 70 is called the continued product of 2, 5, and 7. The continued product of 3, 5, and 4 is \_\_\_\_\_.

2. The continued product of three numbers is 60. Two of the numbers are 3 and 4; the other number is \_\_\_\_\_.

3.  $5 \times 3 \times ( ) = 75$ .  $2 \times 3 \times 4 \times ( ) = 48$ .

4.  $4 \times 2 \times ( ) = 48$ .  $5 \times 7 \times 2 \times ( ) = 210$ .

5.  $8 \times 3 \times ( ) = 96$ .  $3 \times 2 \times 5 \times ( ) = 210$ .

6. 55 ( $5 \times 11$ ) is contained in 165 ( $3 \times 5 \times 11$ ) \_\_\_\_\_ times.\*

7. 63 ( $3 \times 3 \times 7$ ) is contained in 252 ( $2 \times 2 \times 3 \times 3 \times 7$ ) \_\_\_\_\_ times.

$$* \frac{3 \times 5 \times 11}{5 \times 11} = 3.$$

8. 42 ( $2 \times 3 \times 7$ ) is contained in 462 ( $2 \times 3 \times 7 \times 11$ )  
— times.

9. Two farmers had together 24 cows. One had twice as many as the other. One had — cows, the other had — cows. Let  $x$  = No. of cows one had and  $2x$  = No. of cows the other had.  $2x + x = 24$ .  $3x = 24$ .  $x =$  —.  $2x =$  —.

## WRITTEN

*Find the l. c. m of:*

10. 56, 60, and 72.

13. 20, 25, 30, and 35.

11. 60, 70, 80, and 96.

14. 36, 38, 57, and 19.

12. 45, 60, 70, and 80.

15. 24, 48, 60, and 96.

16. The continued product of three numbers is 19,320. If two of the numbers are 28 and 30, what is the third?

17. If the continued product of three numbers is 1080, and two of the numbers are 8 and 15, what is the other?

18. Two men together have \$10,800. If one has twice as much as the other, how much has each?

19. What is the quotient of  $2 \times 3 \times 5 \times 7 \times 11$  divided by  $3 \times 5$ ?

## CII. COMMON FRACTIONS

## ORAL

1. At  $\frac{1}{4}$  of a dollar a pound, for  $\frac{3}{8}$  of a dollar I can buy — pounds of butter.  $\frac{3}{8} \div \frac{1}{4} =$

2. When eggs cost  $\frac{1}{2}$  of a dollar a dozen,  $\frac{3}{4}$  of a dollar will pay for — dozen.  $\frac{3}{4} \div \frac{1}{2} =$

3. When  $\frac{2}{3}$  of a yard of cloth is worth 18¢, 1 yard is worth — cents.

4. When  $\frac{3}{4}$  of a cord of wood is worth \$2.40, 1 cord is worth —.

5. When  $\frac{2}{3}$  of a yard of cloth is worth \$.24, 3 yards are worth —.

6. If wheat is worth  $\frac{3}{4}$  of a dollar a bushel, for \$6 I can buy — bushels.

7. If  $\frac{2}{3}$  of a ton of coal is worth \$2.40, one ton is worth —.

## WRITTEN

8. Add  $53\frac{1}{4}$  yd.,  $72\frac{1}{3}$  yd.,  $69\frac{1}{2}$  yd., and  $403\frac{5}{12}$  yd.

9. Add  $9\frac{1}{6}$  ft.,  $28\frac{3}{4}$  ft.,  $142\frac{2}{3}$  ft., and  $29\frac{1}{4}$  ft.

10.  $18\frac{1}{4}$  lb. +  $16\frac{3}{5}$  lb. +  $24\frac{3}{4}$  lb. +  $29\frac{3}{10}$  lb. +  $14\frac{2}{5}$  lb.

11.  $18\frac{1}{2}$  yd. -  $4\frac{3}{4}$  yd. =

18.  $39\frac{1}{2}$  rd. -  $16\frac{3}{8}$  rd. =

12.  $28\frac{1}{2}$  lb. -  $19\frac{5}{8}$  lb. =

19.  $28\frac{3}{8}$  mi. -  $15\frac{3}{4}$  mi. =

13.  $27\frac{2}{3}$  yd.  $\times 5$  =

20.  $38\frac{5}{8}$  in.  $\times 4\frac{1}{2}$  = †

14.  $69\frac{7}{12}$  ft.  $\times 6$  =

21.  $16\frac{2}{3}$  yd.  $\times 3\frac{1}{2}$  =

15.  $16\frac{1}{2}$  ft.  $\div 1\frac{1}{2}$  ft. = \*

22.  $123\frac{3}{4}$  ft. +  $8\frac{1}{4}$  ft. =

16.  $29\frac{1}{2}$  in.  $\div 4$  = †

23.  $63\frac{3}{8}$  mi. + 6 = †

17.  $67\frac{1}{4}$  in.  $\div 5$  =

24.  $99\frac{3}{4}$  mi. + 7 =

25. If  $\frac{3}{5}$  of a man's property is worth \$22,770, what is all worth?

\* Change to halves. † Do not change to an improper fraction. ‡ Multiply by 4 and then by  $\frac{1}{4}$  and add the results.

## CIII. TO DIVIDE BY A MIXED NUMBER

## ORAL

1. If  $2\frac{1}{2}$  tons of coal cost \$10,  $\frac{1}{2}$  of a ton costs — dollars, and 1 ton cost — dollars.

2. If  $3\frac{1}{2}$  lb. of meat cost 42 cents,  $\frac{1}{2}$  of a pound costs — cent, and 1 lb. costs — cents.

3. If \$4 $\frac{1}{2}$  will buy 18 yd. of silk,  $\frac{1}{2}$  of a dollar will buy — yd., and 1 dollar will buy — yards.

4. If 5 $\frac{1}{2}$  lb. of coffee cost \$1.10,  $\frac{1}{2}$  of a pound costs — cents, and 1 pound costs — cents.

5.  $\$10 \div 2\frac{1}{2}$  means, *find  $\frac{2}{5}$  of \$10.*  $\$ \div 2\frac{1}{2} = \text{—}$ .

6.  $42¢ \div 3\frac{1}{2}$  means, *find  $\frac{2}{7}$  of 42¢.*  $42¢ \div 3\frac{1}{2} = \text{—}$ .

7.  $18 \text{ yd.} \div 4\frac{1}{2}$  means, *find —.*  $18 \text{ yd.} \div 4\frac{1}{2} = \text{—}$ .

8.  $\$1.10 \div 5\frac{1}{2}$  means, *find —.*  $\$1.10 \div 5\frac{1}{2} = \text{—}$ .

9.  $\$21 \div \$3\frac{1}{2}$  means, *find how many times \$3 $\frac{1}{2}$  are contained in \$21.*  $\$3\frac{1}{2}$  are contained in \$21 — times. At \$3 $\frac{1}{2}$  a cord, \$21 will buy — cords of wood.

10.  $\$21 \div 3$  means, *find  $\frac{1}{3}$  of \$21.*  $\frac{1}{3}$  of \$21 is — dollars. If 3 cords of wood cost \$21, one cord will cost — dollars.

11.  $\$21 \div 3\frac{1}{2}$  means, *find two sevenths of \$21.* 2 sevenths of \$21 are — dollars. If 3 $\frac{1}{2}$  cords of wood cost \$21, one cord costs — dollars.

12. If 3 $\frac{1}{2}$  qt. of milk cost 14¢, 1 qt. will cost —.

## WRITTEN

13. If  $2\frac{1}{2}$  tons of hay cost \$55, what will 1 ton cost?
14. If  $3\frac{1}{2}$  cords of wood cost \$17 $\frac{1}{2}$ , what will 1 cord cost?
15. If  $4\frac{1}{2}$  tons of bran cost \$81, what will 1 ton cost?
16. At \$5 $\frac{1}{2}$  a ton, how many tons of coal can I buy for \$37 $\frac{1}{2}$ ?
17.  $\$18 + \$1\frac{1}{2} = *$
21.  $135 \text{ mi.} \div 6 =$
18.  $35 \text{ yd.} + 2\frac{1}{2} \text{ yd.} = \dagger$
22.  $35 \text{ lb.} + 2\frac{1}{2} =$
19.  $\$65 + 2 =$
23.  $63 \text{ mi.} + 1\frac{1}{2} =$
20.  $96 \text{ mi.} \div 3 = \ddagger$
24.  $420 \text{ bu.} \div 3\frac{1}{2} = \S$
25. Make practical problems suggested by Ex. 17-24. (See 9, 10, 11.)

## CIV. THE DIVISOR A MIXED NUMBER

## ORAL

1. If 2 lb. of rice cost 15 cents, one pound costs ——— of 15 cents, or ——— cents.
2. If  $2\frac{1}{2}$  lb. of rice cost 20¢, one pound costs  $\frac{1}{2\frac{1}{2}}$ , or  $\frac{2}{5}$  of 20¢.  $\frac{2}{5}$  of 20¢ are ——— cents.
3. If 3 pounds of sugar cost \$0.18, one pound costs ——— of \$0.18, or ——— cents.

\* One yd. of cloth costs \$1 $\frac{1}{2}$ .

‡ Train 3 hr.

†  $2\frac{1}{2}$  yd. for a coat.§  $3\frac{1}{2}$  acres raise 420 bu. potatoes.

4. If  $3\frac{1}{2}$  pounds of sugar cost 21¢, one pound costs  $\frac{1}{3\frac{1}{2}}$ , or  $\frac{2}{7}$ , of 21¢.  $\frac{2}{7}$  of 21¢ are — cents.

5.  $15¢ \div 2 = 1$  half of 15¢, or — cents.

6.  $20¢ \div 2\frac{1}{2} = 2$  fifths of 20¢, or — cents.

7.  $18¢ \div 3 =$  — — of 18¢, or — cents.

8.  $21¢ \div 3\frac{1}{2} =$  — — of 21¢, or — cents.

9. The least common denominator of two or more fractions is the least common multiple of their denominators.

10. Change  $\frac{5}{28}$  and  $\frac{7}{36}$  to equivalent fractions having their least common denominator.

$$28 = 2 \times 2 \times 7. \quad \text{The l. c. m.} = 2 \times 2 \times 3 \times 3 \times 7 = 252.$$

$$36 = 2 \times 2 \times 3 \times 3. \quad \frac{7}{28} = \frac{63}{252}. \quad \frac{7}{36} = \frac{49}{252}.$$

11.  $\frac{7}{20} \div \frac{1}{24}$  means, *find how many times  $\frac{1}{24}$  is contained in  $\frac{7}{20}$* . The l. c. m. of 24 and 20 is —.  $\frac{7}{20} = \frac{7}{120}$ .  $\frac{1}{24} = \frac{5}{120}$ . — one hundred twentieths are contained in — one hundred twentieths — times.\*

## WRITTEN

12. Add  $\frac{5}{28}$  and  $\frac{7}{36}$ . (See Ex. 10.)

13. Add  $\frac{7}{20}$  and  $\frac{1}{24}$ .

$$14. \frac{7}{30} + \frac{3}{40} =$$

$$15. \frac{1}{16} - \frac{1}{24} =$$

$$16. \frac{1}{16} - \frac{1}{14} =$$

$$17. \frac{7}{24} - \frac{3}{32} =$$

$$18. \frac{3}{16} \div \frac{1}{24} =$$

$$19. \frac{7}{48} \div \frac{1}{32} =$$

$$20. \frac{7}{16} \div \frac{1}{24} =$$

21. If  $3\frac{1}{4}$  yards of silk cost \$6.50, what will  $\frac{1}{4}$  yd. cost? One yard? What is the meaning of \$6.50  $\div 3\frac{1}{4}$ ? (See L. 103.)

\* 5¢ are contained in 42 cents how many times?

## CV. FOUR OPERATIONS IN FRACTIONS

1. If  $2\frac{3}{4}$  tons of hay cost \$55, one fourth of a ton costs — dollars, and one ton costs — dollars.  $\$55 \div 2\frac{3}{4}$  means, find — of \$55.

2. Add  $\frac{7}{12}$  and  $\frac{9}{32}$ .

$$12 = 2 \times 2 \times 3.$$

$$32 = 2 \times 2 \times 2 \times 2 \times 2.$$

The l. c. m. of 12 and 32 is  
 $2 \times 2 \times 2 \times 2 \times 2 \times 3 = 96.$

$$\begin{array}{r} 96\text{ths} \\ \frac{7}{12} \left| \begin{array}{l} 56 \\ 27 \\ \hline 83 \\ 96 \end{array} \right. \end{array}$$

$$\frac{7}{12} = \frac{56}{96}.$$

$$\frac{9}{32} = \frac{27}{96}.$$

3.  $\frac{11}{18} - \frac{5}{24}$ .

$$18 = 2 \times 3 \times 3.$$

$$24 = 2 \times 2 \times 2 \times 3.$$

The l. c. m. of 18 and 24 is  
 $2 \times 2 \times 2 \times 3 \times 3 = 72.$

$$\begin{array}{r} 72\text{ds} \\ \frac{11}{18} \left| \begin{array}{l} 44 \\ 15 \\ \hline 29 \\ 72 \end{array} \right. \end{array}$$

$$\frac{11}{18} = \frac{44}{72}.$$

$$\frac{5}{24} = \frac{15}{72}.$$

4.  $\frac{5}{18} + \frac{2}{27}$ .

$$18 = 2 \times 3 \times 3.$$

$$27 = 3 \times 3 \times 3.$$

The l. c. m. of 18 and 27 is  $2 \times 3 \times 3 \times 3 = 54.$

$$\frac{5}{18} = \frac{15}{54}$$

$$\frac{2}{27} = \frac{4}{54}$$

$$\frac{15}{54} + \frac{4}{54} = \text{—}.$$

The l. c. m. of 18 and 27 is  $2 \times 3 \times 3 \times 3 = 54.$  (4¢ are contained in 15¢ — times.)

## WRITTEN

5. Add  $\frac{2}{15}$  and  $\frac{3}{25}$ .

6. Add  $\frac{7}{8}$  and  $\frac{5}{24}$ .

7. From  $\frac{2}{15}$  take  $\frac{2}{25}$ .

8. From  $\frac{7}{8}$  take  $\frac{5}{24}$ .

9. Divide  $\frac{2}{15}$  by  $\frac{3}{25}$ .

10. Divide  $\frac{7}{18}$  by  $\frac{5}{24}$ .

11.  $\frac{7}{16} + \frac{5}{24} =$

12.  $\frac{7}{20} + \frac{4}{25} =$

13.  $\frac{7}{16} - \frac{5}{24} =$

14.  $\frac{11}{20} - \frac{7}{30} =$

15.  $\frac{7}{16} + \frac{5}{24} =$

16.  $\frac{7}{20} + \frac{4}{25} =$

17. If  $2\frac{3}{4}$  tons of hay cost \$49.50, how much will  $\frac{1}{4}$  of a ton cost? 1 ton?  $\$49.50 \div 2\frac{3}{4}$  means, find —.

18. Divide \$32 by  $2\frac{2}{3}$ .

19.  $\$60 \div 3\frac{1}{3} =$

NOTE. — Allow the pupil to find the l. c. m. by inspection, when he can.

## CVI. DIVISION OF DECIMALS

### ORAL

1. 1.6 divided by 8 = —. 1.68 divided by 8 = —.

2. \$1.5 divided by \$.3 = —. 7.05 divided by .5 = —.

3. If the divisor is a whole number, the quotient has as many decimal places as the —.

4. If the divisor is tenths, the quotient will be a whole number till after the —ths' figure in the dividend is used.

5. .406 divided by .02 = —.\* .081 divided by .03 = —.

6. If the divisor is hundredths, the quotient will be a whole number till after the —ths' figure in the dividend is used.

### WRITTEN

7.  $1.25 \overline{)363.75}$

8.  $.9 \overline{)46.98}$

9.  $2.3 \overline{)49.17}$

10. How many cords in 133.12 cu. ft. of wood?

11. How many cords in 13.312 cu. ft. of wood?

12. At \$.23 each, how many books can be bought for \$19.78?

\* 406 thousandths divided by 20 thousandths = 20.3. ( $20\frac{6}{10} = 20.3$ .)



13. At \$.55 each, how many chickens can be bought for \$58.30?

14. Change 748.8 inches to feet.

15. At \$.12 $\frac{1}{2}$  a pound, how many pounds of meat can be bought for \$7.87 $\frac{1}{2}$ ? \*

16. Change 172.5 feet to yards.

17. Divide 72 by .12.

19. Divide 7.2 by .12.

18. Divide 24 by .15.

20. Divide 2.4 by .15.

## CVII. REDUCTION

### ORAL

1. The numerator of  $\frac{5}{7}$  is —; the denominator is —.

2. The numerator of .4 is —; the denominator is —.†

3. The numerator of .05 is —; the denominator is —.‡

4. The numerator of .016 is —; the denominator is —.

5.  $\frac{5}{7} = \frac{1}{7}$  of 5 =  $\frac{1}{7}$  of 5.000 = .714 + (read 714 thousandths plus).

6. In the fifth example we changed a — fraction to a — fraction. We divided the — by the —.

7. To change a common fraction to a decimal fraction, divide the — by the —.

\* Find how many times \$.125 are contained in \$7.875.

† Ten, *not tenths*.

‡ One hundred, *not hundredths*.

8. .4 may be written  $\frac{4}{10}$ .  $\frac{4}{10} = \frac{2}{5}$ .

9.  $.05 = \frac{5}{100}$ .  $\frac{5}{100} = \frac{1}{20}$ .

10. In the 8th and 9th examples, we changed — fractions to —.

11. To change a decimal fraction to a common fraction, write the numerator over the — in the form of a common fraction and change, if necessary, to lowest terms.

## WRITTEN

*Change to decimals :*

*Change to common fractions :*

12.  $\frac{3}{8}$ .      21.  $\frac{6}{25}$ .      30. .15.      39. .128.

13.  $\frac{5}{8}$ .      22.  $\frac{11}{12}$ .      31. .016.      40. .008.

14.  $\frac{2}{25}$ .      23.  $\frac{7}{11}$ .      32. .24.      41. .075.

15.  $\frac{3}{25}$ .      24.  $\frac{39}{40}$ .      33. .125.      42. .025.

16.  $\frac{7}{12}$ .      25.  $\frac{4}{15}$ .      34. .375.      43. .004.

17.  $\frac{4}{11}$ .      26.  $\frac{7}{15}$ .      35. .625.      44. .024.

18.  $\frac{3}{40}$ .      27.  $\frac{8}{15}$ .      36. .875.      45. .032.

19.  $\frac{7}{40}$ .      28.  $\frac{11}{15}$ .      37. .32.      46. .048.

20.  $\frac{8}{13}$ .      29.  $\frac{13}{15}$ .      38. .45.      47. .012.

48. Find the sum of .15 ton and  $\frac{3}{8}$  ton.

49. Find the difference of  $\frac{5}{8}$  lb. and .125 lb.

50. A dealer bought  $\frac{7}{8}$  ton of sugar. After selling .025 ton, what part of a ton had he left?

51. To .375 cwt. add  $\frac{2}{25}$  cwt.

## CVIII. MILLIONTHS

## ORAL

1. The numerator of .006 is —; the denominator is —.\*

2. The numerator of .0075 is —; the denominator is —.†

3. The numerator of .005432 is —; the denominator is —.‡

4. This number, 27.019, is read 27 and 19 thousandths, with a short pause after 27. It may be read 27 thousand nineteen thousandths, with a slight pause after 19.

5. This number, 246.0079, is read two hundred forty-six and seventy-nine ten-thousandths, with a slight pause after the 246. It should be read with only one *and*, which should take the place of the decimal point. Do not say two hundred *and* forty-six.

6. Read 6.2046, 842.3, 9678.42637, 643.007846.

## WRITTEN

7. Find the sum of .006, .0075, .00149, .005432, 27.019, and 246.0079.

8. Find the sum of 3.6, 72.01, 15.247, and .00583.

\* One thousand, *not thousandths*. The fraction is 6 thousandths or six one-thousandths.

† Ten thousand, *not ten-thousandths*.

‡ One million, *not millionths*.

NOTE. — The denominator of a decimal is expressed by 1 with as many ciphers annexed as there are decimal places in the decimal.

*Write in figures :*

9. Eight and four tenths. (Put decimal point in place of *and*.)

10. Twenty-three and thirty-four ten-thousandths.

11. Two hundred three and sixteen thousandths.

12. Add 9.04, 17.243, 1.0345, 6.7, and 29.04703.

13. From 84.073  
Subtract 2.1946

15. From 8.003  
Subtract .379

14. From 9.07  
Subtract .378

16. From 129.01  
Subtract .9276.

### CIX. INFINITE DECIMALS

#### ORAL

1. The common fraction  $\frac{1}{3}$  changed to a decimal fraction equals — tenths, or — hundredths, or — thousandths, and so on. The decimal is not *finite* but *infinite*.

2.  $\frac{2}{5}$  = — tenths.  $\frac{3}{4}$  = — hundredths. These results are finite decimals.

#### WRITTEN

*Change to decimals, carrying the infinite decimals to thousandths :*

3.  $\frac{15}{16}$ .

7.  $\frac{9}{14}$ .

11.  $\frac{7}{125}$ .

4.  $\frac{7}{50}$ .

8.  $\frac{11}{14}$ .

12.  $\frac{8}{125}$ .

5.  $\frac{4}{17}$ .

9.  $\frac{4}{125}$ .

13.  $\frac{9}{125}$ .

6.  $\frac{5}{14}$ .

10.  $\frac{6}{125}$ .

14.  $\frac{17}{25}$ .

- |                        |                          |                         |
|------------------------|--------------------------|-------------------------|
| 15. $\frac{3}{35}$ .   | 20. $37\frac{7}{16}$ .   | 25. $27\frac{7}{8}$ .   |
| 16. $\frac{4}{35}$ .   | 21. $94\frac{9}{16}$ .   | 26. $98\frac{16}{17}$ . |
| 17. $\frac{6}{35}$ .   | 22. $349\frac{11}{16}$ . | 27. $102\frac{3}{5}$ .  |
| 18. $16\frac{3}{16}$ . | 23. $51\frac{3}{16}$ .   | 28. $49\frac{5}{6}$ .   |
| 19. $29\frac{5}{16}$ . | 24. $7\frac{3}{8}$ .     | 29. $840\frac{3}{11}$ . |

30. Add the numbers in Ex. 18-23.
31. Add the answers of Ex. 18-23.
32. Find the difference of the answers of Ex. 9 and Ex. 10.

### CX. HUNDREDTHS, PER CENT

#### ORAL

1. 5 apples equal ——— of 9 apples.

$$\frac{5}{9} = 5 \div 9 = .55\frac{5}{9}. \quad \begin{array}{r} 9 \overline{)5.00} \\ \underline{.55\frac{5}{9}} \end{array} \text{ or } 55\frac{5}{9}\%.$$

2. 5 apples equal ———% of 9 apples.

3. 5 dollars equal ——— of 6 dollars.

$$\frac{5}{6} = 5 \div 6 = .83\frac{1}{3}. \quad \begin{array}{r} 6 \overline{)5.00} \\ \underline{.83\frac{1}{3}} \end{array} \text{ or } 83\frac{1}{3}\%.$$

4. 5 dollars equal ———% of 6 dollars.

5. A grocer invested \$6000 in business. At the end of one year he found that he had gained \$1000. His gain equalled ——— of his investment.

$$\frac{1}{6} = 1 \div 6 = .16\frac{2}{3}. \quad \begin{array}{r} 6 \overline{)1.00} \\ \underline{.16\frac{2}{3}} \end{array} .16\frac{2}{3} = 16\frac{2}{3}\%. \quad .01 = 1\%; \\ .02 = 2\%; \quad .16\frac{2}{3} = 16\frac{2}{3}\%.$$

6. 5 dollars equal ——— of 7 dollars.

$$\frac{5}{7} = 5 \div 7 = .71\frac{3}{7}. \quad \begin{array}{r} 7 \overline{)5.00} \\ \underline{.71\frac{3}{7}} \end{array} \text{ or } 71\frac{3}{7}\%.$$

7. 3 dollars equal ——— of 7 dollars.

$$\frac{3}{7} = 3 \div 7 = .42\frac{6}{7} = 42\frac{6}{7}\%.$$

## WRITTEN

8. A boy paid \$14 for some oranges. He sold them at a profit of \$3. What per cent profit did he make? (\$3 equal ——— of \$14.)

9. A stationer paid \$15 for some writing paper, and sold it for \$19. What per cent profit did he make? (He gained ——— dollars.)

10. An automobile cost \$900 and was sold for \$700. The loss was ——— dollars. What was the loss per cent? (The loss is what per cent of the cost?)

11. 46 is what per cent of 90?

12. 18 is what per cent of 40?

## CXI. DIVISION

## ORAL

1. If a man earns \$12.5 in 2.5 days, what does he earn in 1 day? In 1 tenth of a day he will earn ——— of \$12.5, or \$.5. In a whole day he will earn ——— times \$.5, or \$5. \$12.5 ÷ 2.5 means, find ——— twenty-fifths of \$12.5, or find 1 twenty-fifth of ten times \$12.5.

$$\begin{array}{r} \$5 \\ 2\cancel{.}5 \overline{) \$12\cancel{.}5} \\ \underline{125} \end{array}$$

2. At \$1.5 each, how many trees can be bought for \$9? \$1.5 are contained in \$9 (\$9.0) — times. — trees can be bought.

$$\begin{array}{r} 6 \therefore 6 \text{ trees.} \\ \$1.5 \overline{) \$9.0} \quad (\therefore \text{ means therefore.}) \\ \underline{9.0} \end{array}$$

## WRITTEN

3. At \$.75 each, how many posts can be bought for \$18? (\$18 = \$18.00.) (See 2d Ex.)

4. At \$.95 a bushel, how many bushels of wheat can be bought for \$32.30?

5. A contractor paid \$629 for labor for 18.5 days. What did he pay each day? (See 1st Ex.)

6. A train running 42.5 miles per hour ran 637.5 miles. How many hours did it take?

7. A boat ran 230.4 miles at the rate of 14.4 miles per hour. How many hours was she in making the trip?

8.  $\$160 \div \$2.5.$

9.  $\$40.8 \div \$2.8.$

## TABLES

## LINEAR MEASURES

12 inches (in.) = 1 foot (ft.).

3 feet = 1 yard (yd.).

$5\frac{1}{2}$  yards = 1 rod (rd.).

320 rods = 1 mile (mi.).

## SURFACE MEASURES

144 square inches (sq. in.)	= 1 square foot (sq. ft.).
9 square feet	= 1 square yard (sq. yd.).
30 $\frac{1}{4}$ square yards	= 1 square rod (sq. rd.).
160 square rods	= 1 acre (A.).
640 acres	= 1 square mile (sq. mi.).

## CUBIC MEASURES

1728 cubic inches (cu. in.)	= 1 cubic foot (cu. ft.).
27 cubic feet	= 1 cubic yard (cu. yd.).
128 cubic feet	= 1 cord (cd.).

## DRY MEASURES

2 pints (pt.)	= 1 quart (qt.).
8 quarts	= 1 peck (pk.).
4 pecks	= 1 bushel (bu.).

## LIQUID MEASURES

4 gills (gi.)	= 1 pint (pt.).
2 pints	= 1 quart (qt.).
4 quarts	= 1 gallon (gal.).

## AVOIRDUPOIS WEIGHT

16 ounces (oz.)	= 1 pound (lb.).
100 pounds	= 1 hundredweight (cwt.).
20 hundredweight	= 1 ton (T.).

1 bu. oats weighs 32 lb.	1 bu. wheat weighs 60 lb.
1 bu. barley weighs 48 lb.	1 bu. beans weighs 60 lb.
1 bu. corn weighs 56 lb.	1 bu. potatoes weighs 60 lb.
1 bu. rye weighs 56 lb.	1 cu. ft. water weighs 62 $\frac{1}{2}$ lb.



## NUMBER RELATIONS

## TIME MEASURES

60 seconds (sec.) = 1 minute (min.).

60 minutes = 1 hour (hr.).

24 hours = 1 day (da.).

7 days = 1 week (wk.).

## COUNTING

12 ones = 1 dozen (doz.).

12 dozen = 1 gross.

12 gross = 1 great gross.

20 ones = 1 score.

24 sheets = 1 quire.

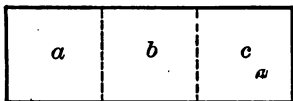
20 quires = 1 ream.

## APPENDIX

### EXPLANATIONS AND SUGGESTIONS FOR TEACHERS

#### PART II

No. 1. Lesson 9, Ex. 1.  $\frac{2}{3}$  of 2.4 = ——. Draw in the presence of the class a rectangle and call it 24 tenths. Divide it into three equal parts,  $a$ ,  $b$ , and  $c$ .  $a$  is — of the rectangle;



$a$  is — tenths.  $b$  is — of the rectangle;  $b$  is — tenths.  $c$  is — of the rectangle;  $c$  is — tenths.  $a$  and  $b$  together are — tenths.  $\frac{2}{3}$  of 2.4 = — tenths, or — and — tenths.

Instead of a rectangle a straight line or a circle may be used in the same way. Pupils should be required to do similar work in explanation. Much time can be profitably spent here, using other numbers in place of 2.4.

No. 2. Lesson 36, Ex. 9, etc.  $\frac{2}{2} =$  one whole,  $\frac{3}{3} =$  one whole,  $\frac{4}{4} =$  one whole,  $\frac{100}{100} =$  one whole.  $100\% = \frac{100}{100} =$  one whole. To show that  $20\% = \frac{1}{5}$ , we may require the pupil to add 20% to itself until the sum is 100%. He will see that he must take it 5 times. Hence  $20\% = \frac{1}{5}$  of one whole. Similarly for 25%,  $33\frac{1}{3}\%$ , 50%,  $12\frac{1}{2}\%$ ,  $16\frac{2}{3}\%$ ,  $14\frac{2}{7}\%$ , and  $11\frac{1}{9}\%$ .

No. 3. Lesson 43, Ex. 1. 56 is  $28\frac{4}{7}\%$  of ——.  $28\frac{4}{7}\% = \frac{2}{7}$ . Draw a straight line, call it 56, and divide it into two equal parts. Since these are 2 sevenths of the required

number, each (28) is 1 seventh, and the required number is 7 times 28, or 196. Draw dotted lines, as shown, for the remaining 5 parts.

A rectangle or a circle could be used similarly.

Use 14, 28, 42, and other numbers in place of 196, until the pupil understands.

No. 4. Lesson 55, Ex. 13. Divide  $3\frac{2}{3}$  by 3. Dividing the whole number by 3, we obtain 1.  $\frac{2}{3}$  divided by 3 equals  $\frac{2}{9}$ . Hence,  $3\frac{2}{3} \div 3 = 1\frac{2}{9}$ . Do not change the mixed number,  $3\frac{2}{3}$ , to an improper fraction. While the gain in time in *this* example is not great, when the integral part of the mixed number is large, the gain is quite marked. For instance,  $8467\frac{2}{3}$  divided by 3 would necessitate as much work in changing the dividend to an improper fraction as the division would require by the method above, and the operation of division would still remain to be done. Only in case the dividend is a mixed number *less* than the divisor should it be changed to an improper fraction if the divisor is a whole number.

No. 5. Lesson 61, Ex. 18. By requiring a carefully prepared form in some such way as follows, this exercise will prove not only instructive, but interesting :

1. $\frac{1}{2} = .5$	$\frac{1}{2} = .50$	$\frac{1}{2} = .500$
2. $\frac{1}{3} = .3\frac{1}{3}$	$\frac{1}{3} = .33\frac{1}{3}$	$\frac{1}{3} = .333\frac{1}{3}$
3. $\frac{1}{4} = .2\frac{1}{2}$	$\frac{1}{4} = .25$	$\frac{1}{4} = .250$
4. $\frac{1}{5} = .2$	$\frac{1}{5} = .20$	$\frac{1}{5} = .200$

and so on.

No. 6. Lesson 62, Ex. 23.  $.15 = \frac{15}{100} = \frac{3}{20}$ .

Ex. 24.  $.125 = \frac{125}{1000} = \frac{25}{200} = \frac{5}{40} = \frac{1}{8}$ .

In examples like the 24th, pupils should be encouraged

to use large divisors, and thus to shorten their work. By comparing the terms of the fraction, they can be led to see that 8 times 125 equals 1000. Therefore, by dividing both terms by 125, the correct result is obtained at once. Dividing both terms by 125 may be regarded as measuring them. Measured thus, the numerator is 1 and the denominator is 8.  $\frac{125}{1000} = \frac{1}{8}$ .

No. 7. Lesson 66, Ex. 17. Change 15 mi. to rods.

15 mi. = 15 times 320 rd., or 4800 rd.  
 320 rd. (Pupils should never be permitted to think that  
 $\begin{array}{r} 15 \\ \times 320 \\ \hline 1600 \\ 320 \\ \hline 4800 \end{array}$  the multiplier is concrete, hence, never allow  
 an operation to pass unchallenged in which  
 the multiplier is written as concrete.) In this  
 operation the multiplier should *not* be written  
 15 mi., but it should appear as above written, as an abstract  
 number.

Ex. 22. Change 1920 rd. to mi. For every 320 rods there is one mile. We divide 1920 rd. by 320 rd. and obtain 6. Hence, there are 6 mi. in 1920 rd.

6  $\therefore$  6 mi. The quotient is not 6 mi., but 6  
 $\begin{array}{r} 320 \text{ rd. } \overline{)1920 \text{ rd.}} \\ \underline{1920} \end{array}$  times. There are 6 320's in 1920,  
 therefore, 1920 rd. are 6 miles.

No. 8. Lesson 67, Ex. 18. How many acres of land in a piece 28 rd. by 40 rd.?

28 sq. rd. Along one end a strip one  
 $\begin{array}{r} 40 \\ \times 28 \\ \hline 1120 \end{array}$  sq. rd. rod wide contains 28 sq. rd.  
 There are 40 such strips. 40  
 7  $\therefore$  7 acres times 28 sq. rd. are 1120 sq. rd.  
 $\begin{array}{r} 160 \text{ sq. rd. } \overline{)1120 \text{ sq. rd.}} \\ \underline{1120} \end{array}$  There are as many acres as  
 there are 160 sq. rd. in 1120

sq. rd. Dividing, 7 is obtained. Hence, there are 7 acres in a piece of land 28 rd. by 40 rd. A diagram may be necessary to make the method clear to some pupils.

No. 9. Lesson 70, Ex. 16. Multiply 54 sq. ft. by 27 and divide the product by 9 sq. ft. Give a practical application.

PRACTICAL APPLICATION. — How many square yards in a rectangular plot of ground 54 ft. long and 27 ft. wide?

No. 10. Lesson 80, Ex. 20. How many cubic feet in a rectangular solid 18 ft. long, 10 ft. wide, and 8 ft. high?

18 cu. ft. That portion of the solid 18 ft. long, 1 ft.  
 10 wide, and 1 ft. high contains 18 cu. ft. That  
 180 cu. ft. portion 18 ft. long, 10 ft. wide, and 1 ft. high  
 8 contains 10 times 18 cu. ft., or 180 cu. ft.  
 1440 cu. ft. As the solid is 8 ft. high, there are 8 such  
 portions. 8 times 180 cu. ft. are 1440 cu. ft.

No. 11. Lesson 79, Ex. 15. Find  $83\frac{1}{3}\%$  of \$720.

$$\begin{array}{r}
 \$720 \\
 \times .83\frac{1}{3} \\
 \hline
 240 \\
 2160 \\
 5760 \\
 \hline
 \$600.00 \\
 \text{or } 6) \$720 \\
 \quad \$120 \\
 \quad \quad 5 \\
 \quad \quad \hline
 \quad \quad \$600
 \end{array}$$

$$\$720 \times .83\frac{1}{3} = \$600,$$

$$\text{or } \$720 \times \frac{5}{6} = \$600.$$

See that pupils understand that either method consists in multiplying \$720 by the rate.

Require them to do several examples both ways. As, find  $87\frac{1}{2}\%$  of \$560;  $66\frac{2}{3}\%$  of \$216;  $62\frac{1}{2}\%$  of \$280; etc.

